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Tenmile – South Helena Project

Draft Environmental Impact Statement

Helena Ranger District, Helena - Lewis and Clark National Forest
Helena, Montana



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**Tenmile – South Helena
Draft Environmental Impact Statement
Lewis and Clark County, Montana
Powell County, Montana
Jefferson County, Montana**

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Abstract: This draft environmental impact statement (DEIS) was developed by the US Forest Service Helena – Lewis and Clark National Forests and the Bureau of Land Management as a cooperating agency (36 CFR 1501.6). The DEIS considers three alternatives in detail. Alternative 1 is the no action alternative, which provides a baseline for comparing the magnitude of environmental effects of the action alternatives. Alternative 2 would treat approximately 24,308 acres in the project area with a combination of improvement harvest (2,483 acres), precommercial thinning (471 acres), regeneration harvest (4,234 acres), Shaded fuel Break (1,415 acres), Private Land Buffers (2,091 acres) and prescribed fire (13,614 acres). Connected actions for alternative 2 would include 43 miles of temporary road construction (all temporary road construction would be decommissioned when harvest activities have been completed), 15 miles of road decommissioning, 32 miles of road reconstruction, and 6 miles of road maintenance. Alternative 3 would treat approximately 18,112 acres in the project area with a combination of improvement harvest (1,382 acres), precommercial thinning (445 acres), regeneration harvest (2,450 acres), Shaded Fuel Breaks (1,282 acres), Private Land Buffers (2,283 acres) and prescribed fire (10,270 acres). Connected actions for alternative 3 would include 24 miles of temporary road construction (all temporary road construction would be decommissioned when harvest activities have been completed), 15 miles of road decommissioning, 28 miles of road reconstruction, and 4 miles of road maintenance.

It is important that reviewers provide their comments at such times and in such a way that they are useful to the Agency's preparation of the Final EIS. Therefore, comments should be provided prior to the close of the comment period and should clearly articulate the reviewer's concerns and contentions. The submission of timely and specific comments can affect a reviewer's ability to participate in subsequent administrative review or judicial review. Comments received in response to this solicitation, including names and addresses of those who comment, will be part of the public record for this proposed action. Comments submitted anonymously will be accepted and considered; however, anonymous comments will not provide the respondent with standing to participate in subsequent administrative or judicial reviews.

SUMMARY

Introduction

The Helena Ranger District of the Helena – Lewis and Clark National Forest (HLCNF) is proposing the Tennmile – South Helena Project. The Project is intended to maintain consistent quantity and quality of water within the City of Helena's Tennmile municipal watershed, as well as improve conditions for public and firefighter safety across the landscape in the event of a wildfire. Additionally, the project is meant to move the resource area toward desired conditions and designed to respond to the goals and objectives outlined in the Helena National Forest Plan as amended (USDA, Forest Service 1986) as well as the Bureau of Land Management lands - Butte Field Office

Resource Management Plan (RMP) (2009).

The Tennmile – South Helena Project Draft Environmental Impact Statement (DEIS) is a site-specific effects analysis of management activities proposed in the Tennmile – South Helena landscape on the Helena Ranger District of the Helena – Lewis & Clark National Forest and portions of the Butte Field Office Bureau of Land Management lands (BLM) publicly administered lands. The Forest Service in cooperation with the BLM (40 CFR 1501.6) has prepared this DEIS in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. This DEIS discloses the direct, indirect, and cumulative environmental impacts that would potentially

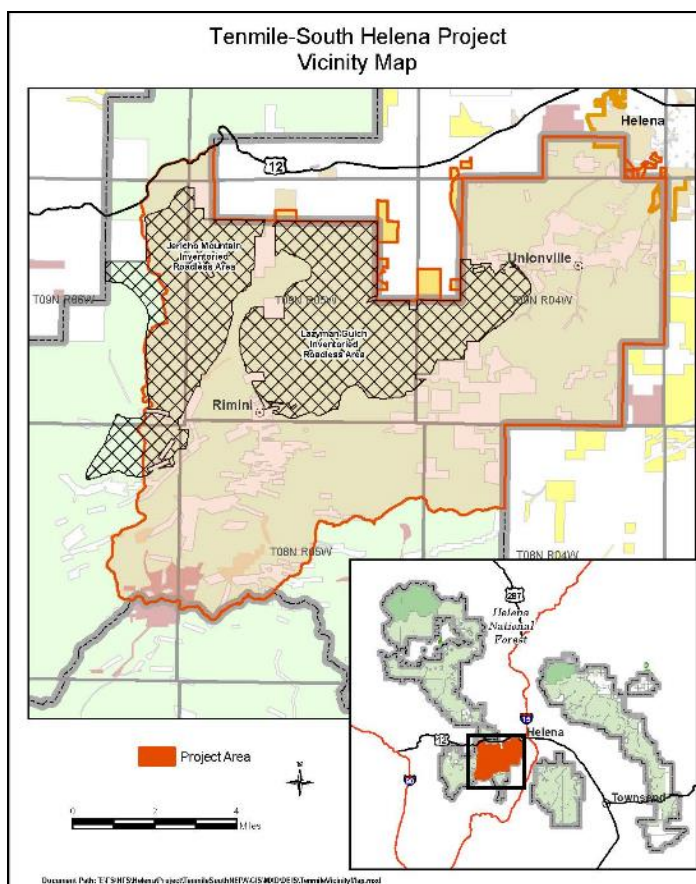


Figure S-1. Tennmile - South Helena Project Vicinity Map

result from proposed activities on Forest Service and BLM lands under each alternative in addition to determining any irreversible and irretrievable commitment of resources that would result from the actions proposed to address forest health, watershed restoration, and fuels management goals of the Helena National Forest Plan, as amended (1986) and the BLM – Butte Field Office – Resource Management Plan (2009). This DEIS is prepared according to the format established by Council on Environmental Quality (CEQ) regulations to implement the NEPA found in 40 CFR 1500-1508. This includes

establishing the Butte Field Office of the Bureau of Land Management as a cooperating agency as specified by 40 CFR 1501.6.

The Tenmile—South Helena Project area covers approximately **61,395** acres in Lewis and Clark, Powell, and Jefferson Counties. This includes approximately **49,546** acres of National Forest System (NFS), **1,043** acres of public lands administered by the Bureau of Land Management (BLM), and remaining acres are private lands or other state and local jurisdictions. No treatments are proposed on private land or other jurisdictions in this project. The project area is also defined by two contiguous areas on the landscape: the western half of the project area, the Upper Tenmile watershed and the eastern half of the project area, the South Hills area of Helena, Montana.

This proposal describes activities on Helena National Forest Service lands in the following drainages: Upper Tenmile Creek, Middle Tenmile Creek, Lower Tenmile Creek, Lump Gulch, Last Chance Gulch and Middle Prickly Pear Creek; and on BLM lands in Colorado Gulch and south of Helena in Last Chance Gulch. The project is located within all or part of sections T10N, R6W Section 36; T10N, R5W Section 31; T10N, R4W Sections 31, 32, 34, 35, 36; T9N, R6W Sections 1, 2, 11, 12, 13, 23, 24, 25, 26, 35, 36; T9N, R5W Sections 1, 6-36; T9N, R4W Sections 1-24, 26-35; T8N, R6W Sections 1, 2, 11-14, 23-26; T8N, R5W Sections 1-12, 14-22, 29, 30; T8N, R4W Sections 5-8.

Statutory and Regulatory Framework

Several important laws, executive orders and policies form the statutory and regulatory framework applicable to managing the Helena National Forest and the Butte Field Office of the Bureau of Land Management (BLM), a partial list for both agencies follows. While most pertain to all Federal lands, some of the laws are specific to Montana. This framework is also an integral part of the purpose and need for action. In addition to the following laws and documents, each specialist report identifies the regulatory framework that is applicable to their analysis. Disclosures and findings required by these laws and orders are contained within each resource specialist report and in the project file.

The National Forest Management Act (NFMA) of 1976 governs vegetation management on national forest lands. Several sections in the act, and its accompanying regulations, specifically address terms and conditions relevant to the vegetation resource. These include sections on timber suitability and management requirements for vegetative manipulation, including tree regeneration timeframes and opening size limits.

The size of harvest openings created by even-aged silvicultural systems will normally be 40 acres or less, and the creation of larger openings requires 60-day public review and Regional Forester approval. However, where natural catastrophic events such as fire, windstorms, or insect attacks have occurred, 40 acres may be exceeded without 60-day public review and Regional Forester approval, provided the public is notified and the environmental analysis supports the decision (USDA 2002). Many proposed treatments in the Action Alternatives would exceed 40 acres due to extensive MPB-caused mortality and a desire to emulate natural disturbance patch sizes, as supported by this analysis. The public is hereby notified of these areas. (Forested Vegetation Specialist Report). In these units and contiguous groups, prescriptions would include varying amounts of tree

retention in surviving components, potentially buffering openings, leaving individuals and clumps throughout units, and including patches of inoperable areas. However, because the overstory is largely dead and reforestation is required, these are considered openings.

The National Environmental Policy Act (NEPA 1969). The Forest Service has prepared this environmental impact statement (EIS) in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. This EIS discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives.

As required under the **Federal Land Assistance, Management, and Enhancement (FLAME) Act** of 2009 the Secretaries of Interior and Agriculture are required to submit a report to Congress on their efforts in producing an integrated wildfire management strategy. The Wildland Fire Leadership Council guided the development of the National Cohesive Wildland Fire Management Strategy, known as the Cohesive Strategy (USDA/DOI 2011), that provides consistent interagency direction.

In 2014, the Tri-County FireSafe Working Group came together to update and improve the 2005 Community Wildfire Protection Plan (CWPP) while still meeting its original intent and goals. This plan was finalized and signed in 2015. This Regional CWPP recommends treatment options be proposed on a landscape scale and develop a strategic plan that looks across jurisdictional boundaries. Propose and implement projects that will protect communities at risk from wildfire. Develop and propose protection measures for municipal watersheds. Focus first on the wildland urban interface communities at risk. Use state of the art fire modeling methods to determine the best places to spatially locate dispersed fuels treatments in the general forested areas outside of the wildland urban interface area. Propose to treat a minimum of approximately 20 percent of the general forested area. (Spatial Strategies for Landscape Fuel Treatments, Mark A. Finney). Activities to accomplish these objectives should include prescribed fire, mechanical or hand thinning, grazing, or combinations of these and other methods.

The Helena National Forest Plan (1986) (FP), as amended, provides detailed direction and guidance for managing public lands on the Helena National Forest. The FP embodies the provisions of NFMA, its implementing regulations, and other guiding documents. Guidance from the Record of Decision for Amendments to the Forest Plan (1986) is incorporated in the Forest Plan. Forest Service Manuals (FSM) and Forest Service Handbooks (FSH) provide direction and were applied to the development of this project. This plan also identifies Management Areas (MAs) and provides direction for each. The actions proposed in this project are designed to be consistent with the Forest Plan, including all plan amendments currently in effect, to the extent possible given the existing conditions. Where Forest Plan direction may not be met, a site-specific Forest Plan amendment would be proposed.

The Forest Plan provides two types of management direction, Forest-wide direction and management area (MA) direction. Forest-wide direction, which applies to all MAs, is located on pages II/14 through II/36 of the Forest Plan. Table S-1 displays the management areas within the project area and the following table lists the acres of each MA found within the project boundary, and relevant goals by MAs as described in the

Forest Plan. The project area overlaps and includes treatments within the Jericho Mountain and Lazyman Gulch Roadless Areas.

Helena National Forest Management Areas H1, H2, L1, L2, M1, R1, T1, T3, T4, T5, W1, W2 and private lands are included in the Tenmile – South Helena project area. The forest-wide management direction in Chapter II of the Forest Plan applies to all management areas (Forest Plan III/1). For additional information on the MA goals, resource potentials, and limitations, see the Helena Forest Plan on pages III/1 to III/92.

The following table is a list of MA's and a summary of the goals relevant to this proposal of the management areas within the project area.

Table S-1. Management Areas and associated acres within the Tenmile – South Helena project area

Management Area (Acres)	Pages In Forest Plan	Goals Relevant To This Proposal
H1 (14,292 acres)	H-1 III/17- III/19	Provide a quantity and quality of water which will, with adequate treatment, result in a satisfactory and safe domestic water supply for the City of Helena. Provide cover and forage for big game animals and necessary habitat components for nongame animals. Provide for dispersed recreation opportunities.
H2 (4,145 acres)	H-2 III/21- III/23	Provide a quantity and quality of water which will, with adequate treatment, result in a satisfactory and safe domestic water supply for the City of Helena. Provide cover and forage for big game animals and necessary habitat components for nongame animals. Provide healthy timber stands and optimize growing potential over the planning horizon while protecting the soil and water resources. Provide for dispersed recreation opportunities.
L1 (1,532 acres)	L-1 III/11-III/13	Maintain or improve vegetative conditions and livestock forage productivity
L2 (739 acres)	L-2 III/14-III/16	Maintain or improve ranger vegetative conditions and forage production for livestock and elk.
M1 (7,486 acres)	M-1 III/5-III/7	Maintain the present condition with minimal investment for resource activities, while protecting the basic soil, water, and wildlife resources.
R1 (4,217 acres)	R-1 III/24- III/26	Provide a variety of semi-primitive and primitive nonmotorized recreation opportunities. Provide for maintenance and/or enhancement of fishery, big game, and nongame habitat, grazing allotments, visual quality, and water quality.
T1 (9,059 acres)	T-1 III/30- III/33	Provide healthy timber stands and optimize timber growing potential over the planning horizon. Emphasize cost-effective timber production, while protecting the soil productivity. Maintain water quality and stream bank stability. Provide for dispersed recreation opportunities, wildlife habitat, and livestock use, when consistent with the timber management goals.
T3 (265 acres)	T-3 III/38- III/41	Maintain and/or enhance habitat characteristics favored by elk and other big game species. Provide for healthy timber stands and timber harvest program compatible with wildlife habitat goals for this area. Emphasize cost – effective timber production, while protecting the soil productivity. Maintain water quality and stream bank stability. Provide for other resource objectives where compatible with the big game summer ranger and timber goals.
T4 (1,040 acres)	T-4 III/42- III/45	Maintain healthy stands of timber within the visual quality objective or retention and partial retention. Provide for other resource uses as long as they are compatible with visual quality objectives. Emphasize cost – effective timber production, while protecting the soil productivity. Maintain water quality and stream bank stability.

Management Area (Acres)	Pages In Forest Plan	Goals Relevant To This Proposal
T5 (5,263 acres)	T-5 III/46-III/49	<p>Increase production and quality of forage. Manage timber sites cost-effectively, by selecting the most economical harvest system and managing for natural regeneration.</p> <p>Provide for healthy stands of timber and timber products consistent with increasing quality and quantity of forage. Emphasize cost-effective timber production, while protecting the soil productivity. Maintain water quality and stream bank stability.</p> <p>Provide for other resource uses that are compatible with the other goals.</p>
W1 (1,412 acres)	W-1 III/50-III/52	<p>Optimize wildlife habitat potential, including old growth, over the long term. Provide for other resource uses, if they are compatible with wildlife management goals.</p>
W2 (96 acres)	W-2 III/53-III/55	<p>Maintain and/or enhance habitat characteristics favored by elk and other big game species during spring, summer, and fall. Provide habitat diversity for non-game wildlife species. Provide forage for both big game and livestock. Provide for other resource objectives as long as their uses are compatible with the wildlife and livestock objectives.</p>

In addition, a description of each management area and pertinent goals are provided in appendix B of this document. This appendix summarizes the Forest Plan Standards and Goals as well as the applicable management area direction. It also provides a synopsis of how the project responds to the standards and guidelines for the Forest Plan and by each management area.

Treatments using harvest may occur in several MAs. Some of these MAs are suitable for timber production, and include goals of managing for healthy stands of timber and optimizing growing potential. Other MAs are considered unsuitable for timber, but harvest may be used as a tool to meet the other objectives of the MA.

Forest Management must also consider direction in the Inland Native Fish Strategy (INFISH 1995) which provides direction to protect habitat and populations of resident native fish outside of anadromous fish habitat. Other pertinent direction including the Northern Rockies Lynx Management Direction is also considered.

The Endangered Species Act of 1973, as amended (ESA 1973, 16 U.S.C. 1531) provides direction to the Forest Service to establish objectives for habitat management and recovery through the Forest Plan for the conservation and protection of endangered and threatened species. This project is consistent with the Forest Plan for listed species and is therefore consistent with these guidelines. The U.S. Fish and Wildlife Service was consulted to determine which species required evaluating for the project. An analysis of effects on listed species was conducted and documented in a Biological Evaluation. Consultation is ongoing and will be completed prior to issuing a decision on this project.

The Migratory Bird Treaty Act, Presidential Executive Order 13186 10 January 2001. Migratory birds are included under the Migratory Bird Treaty Act (MBTA) and incorporate most species of birds present in the project area. In December 2008, the Forest Service entered into a memorandum of understanding (MOU) with the United States Department of Interior (USDI) Fish and Wildlife Service on the Migratory Bird Treaty Act to further clarify agency responsibilities (USDA Forest Service and USDI

Fish and Wildlife Service 2008). Four key principles embodied in the MOU direct the Forest Service to (1) focus on bird populations; (2) focus on habitat restoration and enhancement where actions can benefit specific ecosystems and migratory birds dependent on them; (3) recognize that actions taken to benefit some migratory bird populations may adversely affect other migratory bird populations; and (4) recognize that actions that may provide long-term benefits to migratory birds may have short-term impacts on individual birds. The parties agreed that through the NEPA process, the Forest Service would evaluate the effects of agency actions on migratory birds, focusing first on species of management concern along with their priority habitats and key risk factors.

Executive Order 13186 directs departments and agencies to take certain actions to further implement the MBTA. Specifically, the Order directs Federal agencies, whose direct activities will likely result in the “take” of migratory birds, to develop and implement a memorandum of understanding with the USFWS that shall promote the conservation of bird populations. Under Executive Order 13186 the USFWS is responsible to ensure that environmental analyses of Federal actions evaluate the effects of actions and agency plans on migratory birds, with emphasis on species of concern.

In 1963 Congress passed the **Federal Clean Air Act** and amended the act in 1970, 1977, and 1990. The purpose of the act is to protect and enhance air quality while ensuring the protection of public health and welfare. The 1970 amendments established National Ambient Air Quality Standards (NAAQS), which must be met by most state and federal agencies, including the Forest Service.

States are given the primary responsibility for air quality management. Section 110 of the Clean Air Act requires states to develop State Implementation Plans (SIPs) that identify how the state will attain and maintain NAAQS. The **Montana Clean Air Act** (MCAA)(1967) promulgates the SIP and created the Montana Air Quality Bureau (now under the Montana Department of Environmental Quality-MDEQ). The Clean Air Act also allows states, and some counties, to adopt unique permitting procedures and to apply more stringent standards.

The Federal Clean Water Act, as amended, is commonly referred to as the Clean Water Act (CWA). The CWA required each state to develop its own water quality standards, subject to the approval of the Environmental Protection Agency (EPA). Section 303(d) of the CWA required each state to assess all water bodies within its borders in order to identify water quality impairments that exceeded state standards. Under the CWA, water bodies identified as impaired generally require the development of a “Total Maximum Daily Load” (TMDL—a water quality restoration plan). The state is required to systematically develop these plans in collaboration with the EPA. Some stream segments in the TSH Project area are on the Montana 303(d) list of water-quality impaired streams not fully supporting all listed beneficial uses. Listed impairments include alteration in stream-side or littoral vegetative covers, arsenic, cyanide and sedimentation/siltation. Any permits needed for implementation would be obtained before operations were initiated.

National Historic Preservation Act, Section 106 (1966 as amended) Federal agencies have independent statutory obligations under National Environmental Policy Act (NEPA) and National Historic Preservation Act (NHPA). Section 106 and the NEPA ensures that

our natural, cultural and historic environment is given consideration in Federal project planning. Federal courts have characterized both laws as requiring the Federal Government to “stop, look and listen” before making decisions that might affect historic properties as a component of the human environment. The Advisory Council on Historic Preservation (ACHP) and Council on Environmental Quality (CEQ) developed a handbook called NEPA and NHPA A Handbook for Integrating NEPA and Section 106 (CEQ and ACHP 2013) to address a long standing need to improve the abilities of Federal agencies to conduct these environmental reviews in the most efficient and effective way possible. The handbook provides advice on implementing a 1999 provision in the Section 106 regulations, “Coordination with the Nation Environmental Policy Act”, 36 CFR 880.8. It also provides advice on implementing CEQ regulations requiring the integration of NEPA and other policies.

The NEPA and NHPA Handbook (2013) uses the term “integrate” to encompass the terms used in both Section 106 and the CEQ regulations. “Integrate as used in 40 CFR 1500.0(c) and 1052.25 encompasses “coordinate” as used in 36 CFR 800.8(a) and “substitution” of a NEPA process for Section 106 as used in 36 CFR 800.8(c). When the NEPA review and Section 106 are integrated, whether through coordination or substitution, an agency assesses ways to avoid, minimize, or mitigate adverse effects while identifying alternatives and preparing NEPA documents (CEQ and ACHP 2013).

The HLCNF intends to use the substitution approach for the Tenmile-South Helena project as outlined in the NEPA and NHPA Handbook (2013). Substitution under 36 CFR 800.8(c) permits agencies to use the NEPA review to comply with Section 106 as an alternative to the process set out in 36 CFR 800.3-800.6 (CEQ and ACHP 2013). The use of a substitution approach allows agencies to use the procedures and documentation required for the preparation of an EIS/ROD to comply with the Section 106 procedures (CEQ and ACHP 2013). To do so, the agency must notify the ACHP, State Historic Preservation Office (SHPO) and Tribal Historic Preservation Offices (THPO) in advance that it intends to do so and meet certain specified standards and documentation requirements as set forth in 36 CFR 800.8(c)(1). The HNF notified the ACHP and the MT SHPO in February 2015 of their intent to use this substitution approach for the Tenmile-South Helena project. The THPOs were notified of this approach in March 2015.

Roadless Area Conservation Rule. The Department of Agriculture, Forest Service adopted the Roadless Area Conservation Rule in 2001 (36 CFR 294) with the purpose “to establish prohibitions on road construction, road reconstruction, and timber harvesting in inventoried roadless areas on National Forest System lands. The intent of this final rule is to provide lasting protection for inventoried roadless areas within the National Forest System in the context of multiple-use management.” Within this rule, the Agency decided to establish a national level rule for the management of roadless areas. Decisions made in the 1986 Helena Forest Plan that allowed certain forms of timber harvesting and/or road construction and/or road reconstruction in inventoried roadless areas must follow the intent of this rule.

Within this rule, the cutting, sale, or removal of trees must be clearly shown through project level analysis to contribute to the ecological objectives described in 36 CFR

294.13(b)(1), or under the circumstances described in paragraphs (b)(2) through (b)(4). Such management activities are expected to be rare and to focus on small diameter trees. Thinning of small diameter trees, for example, that became established as the result of missed fire return intervals due to fire suppression and the condition of which greatly increases the likelihood of uncharacteristic wildfire effects would be permissible.

Within this rule the characteristics of Roadless Areas are identified. They include:

- High quality or undisturbed soil, water, and air.
- Sources of public drinking water.
- Diversity of plants and animal communities.
- Habitat for threatened, endangered, proposed, candidate, and sensitive species, and for those species dependent on large, undisturbed areas of land.
- Primitive, semi-primitive nonmotorized and semi-primitive motorized classes of dispersed recreation.
- Reference landscapes.
- Natural appearing landscapes with high scenic quality.
- Traditional cultural properties and sacred sites.
- Other locally identified unique characteristics.

The Native American Graves Protection and Repatriation Act, and the American Indian Religious Freedom Act of 1978 require Federal agencies to consult with culturally affiliated tribes and determine possible effects to sites and other culturally significant resources resulting from activities within a proposed project area.

Carlson-Foley Act of 1968 (Weed Control on Public Lands): The Carlson-Foley Act (P.L. 90-583) directs federal agencies to enter upon lands under their jurisdiction having noxious plants (weeds), and destroys noxious plants growing on such land.

Federal Noxious Weed Act of 1974, as amended in 1988, 1994: The Federal Noxious Weed Act of 1974 (P.L. 93-629) (7 U.S.C. 2801 et seq.), as amended by the Food, Agriculture, Conservation and Trade Act of 1990, Section 1453 (Section 15 - “Management of Undesirable Plants on Federal Lands”), directs federal agencies to have an office or person trained to coordinate an undesirable plant management program, adequately fund the program, implement cooperative agreements, and conduct IPM Techniques.

Butte Field Office of the BLM Resource Management Plan (2009). As part of the Tenmile – South Helena project, a variety of vegetation and prescribed burning treatments are proposed on approximately 1,043 acres of BLM lands administered by the Butte Field Office (BFO). The Resource Management Plan (RMP) provides a single, comprehensive land use plan to guide management of public lands as administered by the BFO. The plan provides goals, objectives, allowable uses, and management direction to maintain, improve, or restore resource conditions and to provide for long-term economic needs of local communities. The BFO RMP goals and objectives only apply to proposed activities located on BLM lands. The actions proposed in this project are designed to be

consistent with the BFO RMP. BFO RMP goals pertaining to the Tenmile – South Helena Project include: FM1, FM2, FW1, FW2, FW3, and FW4.

FM1- Provide an appropriate management response to all wildland fire, emphasizing firefighter and public safety.

FM2- Move towards restoring and maintaining desired ecological conditions consistent with appropriate fire regimes.

FW1- Restore and/or maintain the health and productivity of public forests, to provide a balance of forest and woodland resource benefits, as well as wildlife and watershed needs to present and future generations.

FW2- Manage forestry resources to provide a sustained flow of local social and economic benefits and protect non-market economic values.

FW3- Maintain and/or improve sustainability and diversity of woodland communities to meet ecological site potential.

FW4- Manage dry forest types to contain healthy, relatively open stands with reproducing site-appropriate, desired vegetation species.

Vegetation Treatments Using Herbicides on BLM Lands in 17 Western States Programmatic EIS approved on September 29, 2007 and the Butte Field Office Weed Management Plan Revision (MT-B070-2009-00011-EA), approved May 2009 provide guidance for weed treatment with the use of herbicides on federal BLM lands.

Title 43, USDI-BLM Code of Federal Regulations, Part 5003 (2015): Title 43 is the principle set of rules and regulations issued by federal agencies of the United States regarding public lands under the jurisdiction of the Department of the Interior. Part 5003 provides direction on administrative procedures for activities proposed on Bureau of Land Management lands. This regulation only applies to proposed activities located on BLM lands.

The **Federal Land Policy and Management Act (FLPMA) was enacted in 1976** for the purposes of establishing a unified, comprehensive, and systematic approach to managing and preserving public lands in a way that protects "the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archeological values." The FLPMA is administered by the Bureau of Land Management (BLM). Under the FLPMA, the BLM is required to establish a planning process for the management of public lands that accommodates multiple uses of the land and its resources and achieves sustained yields of natural resources.

Other Considerations

The Northern Region Overview (1998) sets priorities for ecosystem restoration and focuses the Forest Service Natural Resource Agenda for the National Forest lands of the Northern Region. For forest vegetation, the overview establishes indicators of risk to the proper functioning conditions of this ecosystem. Risk indicators include: (1) the loss of species composition at the cover type level, (2) the change in landscape level fragmentation, and (3) stand level structure as measured by density and seral stage/size class distribution. The overview also describes the importance of restoring ponderosa

pine, western larch, and whitebark pine (USDA, 1998). The overview identifies aspen, whitebark pine, ponderosa pine, sagebrush, and grasslands among the areas of concern currently at risk in the Northern Region. The agents of change listed for these areas of concern include mountain pine beetle (MPB), fire (including suppression), blister rust, root disease, noxious weeds/exotic species, grazing, and timber harvest.

Forest Service Manual (FSM) and Forest Service Handbook (FSH): The Forest Service Manuals and Handbooks provide management direction and guidance for Forest Service analysis and activities. See the individual specialist reports for the applicable sections.

Northern Region Integrated Restoration and Protection Strategy. The Northern Region Integrated Restoration and Protection Strategy provides information to help local Forest Service units identify and prioritize potential areas for accomplishing Forest and Grassland Plan goals and objectives, and thus meeting this mission. This strategy focuses on restoration and maintenance of watersheds, wildlife habitats (including more resilient vegetation conditions), and the protection of people, structures, and community infrastructure in and associated with the wildland-urban interface. Values in these focus areas may be threatened by large scale fires, drought, insects and disease, invasive plants and animals, forest encroachment into grasslands, dense vegetation that create hazardous fuel conditions, erosion, sedimentation, and toxic chemicals.

R1 Guidance for Roadless Area Analyses. Region 1 provides additional guidance for roadless area analysis in a draft document titled “Our Approach to Roadless Area Analysis and Analysis of Unroaded Lands Contiguous to Roadless Areas” (12/2/10). In summary this paper is based on court history regarding the Roadless Area Conservation Rule. The “Our Approach” document states that “projects on lands contiguous to roadless areas must analyze the environmental consequences, including irreversible and irretrievable commitment of resources on roadless area attributes, and the effects for potential designation as wilderness under the Wilderness Act of 1964. This analysis must consider the effects to the entire roadless expanse – that is both the roadless area and the unroaded lands contiguous to the roadless area.”

Species Designation for Whitebark Pine R1 Regional Forester Letter (2011) This letter specifies that whitebark pine is designated as a sensitive species in Region 1 because of the U.S. Fish and Wildlife Service finding that the listing of whitebark pine under the Endangered Species Act (ESA) was warranted but precluded, making it a candidate species for listing. The letter notes that the designation should not change our approach to restoration of whitebark pine, and in fact hopefully accelerate actions to restore whitebark pine (USDA 2011b).

Purpose and Need for Action _____

Purpose

1. Maintain a consistent quantity and quality of water within the municipal watershed:
 - Reduce the probability of high-severity wildfires and their associated detrimental watershed effects in the Tennile Municipal Watershed and surrounding area

- Reduce sources of sediment and other contaminants to water sources
2. Improve conditions for public and firefighter safety across the landscape in the event of a wildfire.

Need for Action

In order for this project to contribute to the above purposes, there is a need to:

- Create a mosaic of vegetation and fuel structure more resilient to disturbance which would provide for safer, more effective fire suppression actions and improve public safety. Reducing intensity of wildfires and increase fire suppression effectiveness would improve protection measures for the surrounding communities and key municipal watershed infrastructure. These actions would reduce the probability of post-wildfire watershed impacts in the Tennmile municipal watershed.
- In addition, sources of anthropogenic sediment to streams need to be addressed in order improve water quality, watershed function, and other resource values in the project area.

The following sections discuss in greater detail the objectives related to these needs.

Maintain a consistent quantity and quality of water and reduce the probability of high-severity wildfires and their associated detrimental watershed effects in the Tennmile Municipal watershed and surrounding areas.

The combination of dead fuel and continuous live vegetation from the forest floor to the upper forest canopy has created a complex fuel type that, when ignited under severe fire conditions, would likely leave little or no surviving above-ground vegetation. In the event of a wildfire during typical summer conditions, detrimental effects to the watershed could include loss of canopy cover and associated impacts to riparian function, loss of the soil duff layer, soil water-repellency, greatly increased soil erosion from burned hillslopes, gully erosion and flooding, sedimentation of streams, other water quality impacts, and stream temperature increases.

A primary goal of this project is to maintain a consistent quantity and quality of water and reduce the probability of high-severity wildfire effects within the municipal watershed. In order to meet this purpose, there is a need to alter fire behavior in 20-40 percent of the watershed with strategically located units, assuming treated areas were selected in a manner that was informed by fire behavior modeling (Finney 2015).

The effectiveness of fuels treatments at modifying fire behavior is influenced by the location and spatial extent of those treatments. In the case of the Tennmile watershed, strategically located treatment of 20 to 40 percent of the landscape was predicted to effectively modify fire behavior to achieve desired outcomes, whereas randomly placed treatments would require a greater percentage to be effective (Finney 2015).

Create a mosaic of vegetation and fuel structure that is more resilient to disturbance.

A primary goal of this project is to create a mosaic of vegetation and fuel structure that is more resilient to disturbance which in turn would also provide for safer, more effective fire suppression actions. The action alternatives are designed to improve the heterogeneity across the project by creating patches and patterns that, to some extent, emulate natural fire which has been excluded from this ecosystem for a century. Proposed treatments would promote resilience to disturbance by creating a mosaic of stand densities, species composition, and age class. The various proposed treatment activities are designed to increase species diversity by providing growing space to seral species (ponderosa pine, lodgepole pine, whitebark pine and quaking aspen) within a forested landscape that is now dominated by Douglas fir and spruce due to the MPB epidemic. A resilient landscape is diverse so that not all areas are equally susceptible to the same disturbances at the same time.

Thinning some of the stands established after past harvest would also promote resilience, individual tree growth, and diversity of these younger forests that provide the primary green forests on a regenerating landscape. Encouraging a mosaic of reforestation would increase the potential that natural wildfires would burn at sizes and intensities more consistent with historic regimes. Removing beetle-killed lodgepole stands would alter the behavior and severity of potential future wildfires (Collins et al. 2012). This would help ensure that a full range of ecological and social values (i.e. reducing risk to the municipal watershed) are provided through time.

Improve conditions for public and firefighter safety across the landscape in the event of a wildfire.

This project proposes to strategically locate fuels reduction treatments in areas that would allow for safer, more efficient and direct initial attack of wildfire by suppression resources. Fuels reduction treatments proposed in this project area would result in a reduction in flame length and fireline intensity. The firefighting environment would be improved due to reductions in wildfire's resistance to suppression, reduced overhead hazards and reduction of dead and down trees.

Reduce sources of anthropogenic sediment and other contaminants to water sources.

Anthropogenic fine sediment is a listed contaminant in some streams within the Tenmile – South Helena project area. This water quality impairment is primarily a result of past mining activity, forest roads, and livestock activities. The project provides an opportunity to improve road-related conditions to reduce chronic sediment load in project-area watersheds by improving open roads, replacing undersized or failing culverts, re-routing a road that traverses a wetland, and decommissioning unneeded or unauthorized routes.

Background

Heavy fuel accumulations and dense forest stands exist throughout the project area as a result of decades of effective fire suppression, limited management activities and ongoing

insect and disease mortality. These conditions cause an increased risk of landscape-scale wildland fires and their associated effects. In the event of a wildfire in the project area during typical summer conditions, suppression would likely be difficult and the probability of successfully protecting important values and infrastructure would be low. Such a fire would pose risk to firefighter safety, public safety and property, critical City of Helena water supply infrastructure, soil and water resources, wildlife habitat, and other important values.

Communities located within and adjacent to the project boundary have been identified by the Tri-County Community Wildfire Protection Plan as communities at risk of being impacted by wildfire due to their close proximity to extensive hazardous fuel accumulations on adjacent public lands. These communities include Unionville, Rimini, and the City of Helena. At-risk critical infrastructure exists in the project area and includes private property, structures, roads, utility corridors, City of Helena water supply, and communication system components.

In addition to the City of Helena, local residents, partners, and other agencies have expressed similar concerns. Given the existing condition, concerns expressed by a broad constituency in the area, and in keeping with the Forest Plan direction and its goals, the Helena National Forest Interdisciplinary Team identified the purposes and needs for the project area.

The purpose and need for action is determined by the extent and magnitude of differences between the existing and desired conditions on the landscape. Where there is little difference between these two conditions, the need for action is low. However, the difference between existing and desired conditions in the analysis area was determined to be large, and the need for action compelling.

Forest Vegetation and Fuel Conditions

Fire was historically the predominant natural disturbance in the Northern Rockies, including the Tenmile – South Helena project area; lightning ignitions largely determined where and when fires started (Agee 1993; Baker 2002; Pyne 1982) while indigenous burning is presumed to have occurred at lower elevations within the project area (Kimmerer and Lake 2001). Low elevation dry forests in the Northern Rockies have experienced changes in disturbance processes, structure, and function. Causes of change include fire suppression, forest management, and climate change (Hessburg and Agee 2003; Hessburg et al. 2005; Westerling et al. 2006). Changes include higher tree density, more multi-storied stands and ladder fuels, and a greater homogeneity of structures across the landscape. This in turn results in a greater probability for disturbances to affect large contiguous areas (Hessburg et al. 2005). Forest types with naturally high fire frequencies and mixed severity regimes—primarily ponderosa pine and Douglas-fir—have been altered substantially (Hessburg et al. 2005). The forest conditions described by research in the Northern Rockies are observed in the forest vegetation within the project area. Fire in dry forests has shifted from low-intensity, high-frequency regimes to moderate and high-severity regimes, with consequent increases in uncharacteristic large-scale stand-replacing fires (Lehmkuhl et al. 2007). Landscapes are increasingly homogeneous in composition and structure, and the regional landscape is set up for severe, large fire and insect disturbance events (Hessburg et al.

2005). The role of fire as a stand replacement agent becomes more pronounced when the natural fire-free interval is increased through fire suppression.

The Divide landscape, where the Tenmile – South Helena project is located, historically would have burned an average of roughly 39,000 to 170,000 acres per decade (Hollingsworth 2004). These fires would have included low to moderate-intensity fire in dry conifer fire groups and stand-replacing fire in moist conifer fire groups. Fire occurrence records indicate that no fires at this scale and intensity have occurred on this landscape in the last century. The lack of fire on the Divide landscape – principally a result of fire suppression efforts – has resulted in an altered mosaic of vegetation.

The vegetation conditions that exist today in the Tenmile Creek watershed (the western part of the project area) were shaped not only by fire suppression, but also climatic trends, large fires that occurred prior to settlement, and fuelwood cutting that occurred around the turn of the previous century to support the mining and railroad industries. Management activities have also influenced current vegetation conditions, but to a much smaller extent than the aforementioned factors. Fire history maps indicate that much of the area burned in large wildfires in 1889 and 1904 (USDA HNF 2008, Hatton 1904). Fuelwood cutting for the mining and railroad industries was also common around the turn of the century. The climate early in the 20th century when forests were re-establishing following these disturbances was generally cool and moist, conducive to forest growth. The landscape became characterized by relatively densely stocked stands dominated by even-aged lodgepole pine, with some subalpine fir and spruce at upper elevations and drier Douglas-fir dominated at lower elevations. With the exception of small fires that were suppressed, the homogeneity of this landscape has been largely unbroken. While stand replacement effects would have been typical, there would also have been mixed and low severity fires that left substantial remnant components. The limited areas of past harvest have regenerated and support young forested stands; today these areas stand out as “green forest” areas surrounded by dead and dying trees impacted by the mountain pine beetle (MPB).

The South Hills portion of the project area (the eastern part) is lower in elevation, and is a landscape of large grasslands and dry forests. Historically, many dry coniferous forests were shaped by frequent, low-intensity fire; this included the warm, dry as well as moist Douglas-fir habitat types of the Tenmile – South Helena project area. This disturbance regime sustained open, large-tree-dominated structures with diverse and productive understory communities (Arno 1980, Hessburg and Agee 2003). However, over the last century, fire suppression, livestock grazing, and high-grade logging, among other factors, have altered the structure and function of dry coniferous forests across much of western Montana, including the project area. Forest structure and composition has been most significantly altered with the lack of fire disturbance. The disruption of the natural fire intervals in the past several decades have resulted in higher-density, multi-layered stands of mostly one species, Douglas-fir. Dramatically higher stand densities and development of ladder fuels (Covington and Moore 1994; Arno et al 1995; Peterson et al 2009) increase the risk of uncharacteristically severe wildfire (Everett et al 2000; Friederici 2003), bark beetle infestations (Fettig et al 2007), and in some areas such as the Tenmile – South Helena project area, successional replacement by shade-tolerant competitors (Fischer and Bradley 1987; Mutch et al 1993; Habeck 1994; McKenzie et al 2004).

Mountain pine beetle has been the most damaging insect to trees on the HNF in recent years. The MPB outbreak reached the peak of active infestation area in 2009 and has been subsiding since. On the HNF, MPB infestation peaked at roughly 585,600 acres in 2009 (Gibson 2009), covering over 60 percent of the administrative land base. While most of the trees killed were lodgepole pine, ponderosa and whitebark pine were also affected. Within the Tenmile – South Helena project area, most forested pine stands have experienced the effects of MPB.

Wildland Urban Interface (WUI)

The project area lies within the area analyzed in the Tri-County Community Wildfire Protection Plan (Tri-County CWPP). The first CWPP for Broadwater, Jefferson and Lewis and Clark counties was approved in 2005 and was designed to help the communities within these counties to clarify and refine priorities for the protection of life, property, and critical infrastructure in the wildland urban (WUI) interface. In 2014, the Tri-County FireSafe Working Group (TCFWG) came together to update and improve the 2005 CWPP while still meeting its original intent and goals. The 2015 Tri-County Regional CWPP follows the National Fire Plan and involved a collaborative process including Lewis & Clark County, Jefferson County, Broadwater County, City of Helena, Montana Department of Natural Resources, Forest Service and the Bureau of Land Management, individual citizens, interested contractors and fire suppression departments. The TCFWG defined the WUI boundary as the area within four miles of communities that possess a population density exceeding 250 people per square mile. Projects proposed in the WUI would become a priority for accomplishment (2015 Tri-County CWPP). Roughly 97 percent of the Tenmile – South Helena project area has been designated in the CWPP as falling within a WUI zone. This includes the communities of Unionville, Rimini, and the City of Helena.

Tenmile Municipal Watershed (City of Helena's Municipal Water Supply)

Several headwater drainages in the Tenmile Creek watershed serve as the primary source of municipal water for the City of Helena. Most of these drainages are within the Upper Tenmile Creek 6th-Hydrologic Unit Code (6th-HUC) watershed, which has been identified by the Helena National Forest as a Priority Watershed for restoration.

Proposed Action

The proposed action was designed to meet the purpose and need, forest plan management area objectives, BLM BFO RMP goals and objectives, and to be responsive to issues raised by Forest Service and BLM specialists and past collaborative group recommendations for the project area. The proposed action was presented to the public during the scoping process (see Public Involvement section in chapter 1 of the DEIS) which identified issues that drove the development of alternative ways to meet the purpose and need. The proposed unit-by-unit treatment summary can be found in appendix A of this DEIS.

Vegetation and Prescribed Fire Treatments

Implementation of proposed treatments would include the use of ground-based mechanical equipment, cable systems, and hand and/or fire treatments in order to remove hazardous fuels from the project area (Maps – DEIS Appendix E). Approximately 43 miles (39 mile on FS lands and 4 on BLM lands) of temporary road construction, 6 miles of road maintenance, and 32 miles of road reconstruction would be needed to implement the proposed action. There would be an estimated total of 38 miles of haul route needed. All temporary roads would be obliterated after harvest activities have been completed. Post-treatment activities would include treating all units with prescribed fire (underburning, site prep burning, broadcast burning, jackpot burning, and handpiling/burning). Up to approximately 7,936 acres of prescribe fire and or vegetation treatments could occur in within the Inventoried Roadless Areas (Jericho Mountain and Lazyman Gulch IRAs).

Watershed Improvement

Watershed improvement activities are proposed with the intention to improve water quality and aquatic habitat conditions in project area streams and wetlands, including streams that deliver water to the City of Helena's municipal water supply intakes. These activities also move the forest toward meeting the restoration goals of the Lake Helena Total Maximum Daily Load (TMDL) report (EPA 2006). These activities would occur in both action alternatives and include wetland restoration, westslope cutthroat trout restoration, culvert upgrades, and road decommissioning. Chapter 2 of this DEIS presents additional detailed information on proposed watershed improvement activities.

Site-Specific Forest Plan Amendment

A site-specific Forest Plan amendment may be needed for various forest-wide standards regarding big game thermal cover on winter range, open road densities during the big game hunting season, winter range, and different recommendations from the Montana Elk Logging Study in addition an amendment to specific management area standards. The amendment to standards would apply to the Jericho, Black Mountain-Brooklyn Bridge, and Quartz Creek elk herd units. Chapter 2 of this DEIS provides additional detailed information on the site-specific amendment to standards for wildlife.

Scope of the Analysis

The proposed action is limited to specific fuel and vegetation treatments as well as watershed and aquatics improvement and road management activities proposed on National Forest System (NFS) and BLM administered lands in the Tenmile – South Helena Project area. **The geographic extent of some areas used to analyze different resource components (i.e. watershed, fuels and wildlife home range) may extend beyond the project area. The analysis of effects disclosed in this document includes those occurring from the entire “scope” of the decision. Scope is defined in 40 CFR 1508.25 as the range of actions, alternatives, and impacts to be considered in an EIS.**

Decision Framework

The Responsible Official for proposed activities on lands administered by the NFS is the Forest Supervisor of the Helena – Lewis & Clark National Forest. The Responsible Official for proposed activities on lands administered by the BLM is the Field Manager of the BLM – Butte Field Office. Each Responsible Official will make their own decisions for their respected agencies and document them in separate Record of Decisions (ROD) following the completion of the final environmental impact statement (FEIS). Decisions to be made are as follow:

Decisions to be made on NFS Lands:

- Whether to implement the proposed action or an alternative to the proposed action for those portions located on NFS lands;
- What monitoring requirements are appropriate to evaluate implementation of this project for those portions located on NFS land, and;
- Whether a forest plan amendment is necessary.

Decisions to be made on BLM lands:

- Whether to implement the proposed action or an alternative to the proposed action for those portions located on BLM lands and;
- What monitoring requirements are appropriate to evaluate implementation of this project for those portions located on BLM lands.

Issues

Issues serve to highlight effects or unintended consequences that may occur from the proposed action or alternatives. The Tenmile – South Helena IDT separated the issues identified during scoping into two groups: significant and non-significant issues. Significant issues were defined as those directly or indirectly caused by implementing the proposed action or alternatives, involve potentially significant effects, and could be meaningfully and reasonably evaluated and addressed within the scope of this proposal¹. Alternatives were developed around those significant issues that involved unresolved conflicts concerning alternative uses of available resources.

The IDT for the Tenmile – South Helena project identified the following significant issues during scoping:

¹ Some issues have already been considered and evaluated through broader programmatic NEPA (e.g. the 1986 Helena National Forest Plan FEIS, 2006 Helena National Forest Weed Treatment Project FEIS, 2007 Northern Rockies Lynx Management Decision FEIS, 2009 BLM Butte Field Office Weed Management Plan Revision). In these cases, the issues focus on evaluating the effects unique to and commensurate with the decisions being considered here (40 CFR 1401.7(a)(3)).

Inventoried Roadless Areas

Several commenters expressed concern about proposed activities within the Jericho Mountain and Lazyman Gulch Inventoried Roadless Areas (IRAs). Specifically, concerns were about the use of mechanized equipment to implement proposed vegetation and prescribe burning activities in IRAs; commercially harvesting timber within IRAs; proposed treatment in and around Black Hall Meadows located in the Lazyman Gulch IRA; as well as the proposal of any treatments located in IRAs. In some cases, commenters requested that a new alternative be developed that would incorporate these issues while others requested analysis be done that displays how proposed activities may potentially effect the IRAs' consideration for future wilderness designation. Alternative 3 features no mechanized treatment or commercial harvest within IRAs; the exception to this is mechanized treatments would be allowed within private land buffer units. Also featured is an overall reduction in treatments within IRAs.

Additionally, modifications were made to the initial proposed action that took into account scoping issues such as removing proposed treatments in and around Black Hall Meadows. Further, an analysis has been conducted that displays the potential effects of proposed activities on Inventoried Roadless and Roadless Area resources (see chapter 3 of this DEIS).

Measures to Evaluate:

- Acres of mechanical treatment in IRA
- Acres of commercial harvest in IRA
- Acres of treatment in IRA

Elk Security and Hiding Cover

Several commenters also had concern about possible treatments effects on elk security and hiding cover. In summary, commenters requested that hiding cover be maintained in areas adjacent to previously treated lands in past projects as well as to limit the effects on existing hiding cover throughout the project area. Alternative 3 features a reduction in the amount of hiding cover treated within security and intermittent refuge areas. This includes areas adjacent to past treated areas as well as within elk herd units as a whole.

Measures to Evaluate:

- Treatment acres occurring within mapped security areas.

Recreational Trails

Several commenters were concerned about the use of mechanical equipment to access treatment units and/or implement proposed vegetation treatments immediately adjacent to popular recreational trails within the project area. Specifically, commenters requested that non-motorized trails throughout the project area (39 miles), in particular trail #348, the Continental Divide National Scenic Trail (CDNST), and trails located within the Helena South Hills, not be used to facilitate mechanical entry into proposed vegetation units. Also requested was to not convert non-motorized trails into roads for the purpose of implementing proposed vegetation treatments and to not conduct treatments along the

CDNST. Alternative 2 is the only action alternative that proposes the use of mechanical equipment on non-motorized trails (South Hills, Switchback, and CDNST trails). Impacts are anticipated to be short-term and would not occur on the entire length of the trails. Instead, mechanical equipment would utilize the trail only in select locations while other portions of the trail could be treated via hand methods or could receive no treatment at all. Alternative 3 limits mechanical equipment on existing non-motorized trails by proposing to only utilize hand treated methods in the Helena South Hills, IRAs, and along the CDNST. However, alternative 3 still proposes vegetation treatments along the CDNST but would be conducted with non-mechanized methods. The absence of treatment along the CDNST is considered and analyzed under alternative 1.

Measures to Evaluate:

- Miles of trail within treatment units.

Road Construction

Several commenters were concerned about new road construction, along with re-construction of existing roads. Concerns with road building included weed introduction/spread, illegal motorized use, habitat security, and erosion/sedimentation. Alternative 3 was designed to address wildlife concerns and minimize new temporary road construction, while still being able to meet overall project objectives.

Measures to Evaluate:

- Miles of temporary road construction followed by full obliteration, miles of road maintenance, miles of road reconstruction, and miles of haul routes

Alternatives

Section 102(2)(3) of the NEPA states that all Federal agencies shall “study, develop, and describe appropriated alternatives to recommend courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources.”

Resource specialist for the project were requested to take a hard look at reasonable alternatives in order to provide full and fair discussion of significant environmental impacts so as to inform decision makers and the public of the reasonable alternatives which would avoid or minimize adverse impacts or enhance the quality of the human environment (40 C.F.R. § 1502.1).

The range of alternatives may extend beyond the limits set by Forest Plan goals and objectives under the NEPA; however, the NFMA requires that the selected alternative fully comply with the Forest Plan, unless the plan is amended in accordance with 36 CFR 219.10(F).

The range of alternatives developed and presented in chapter 2 of this DEIS was based on evaluation of public, partner, and internal comments during scoping of the purpose and need for the project. This project is intended to meet the purpose and need while maintaining resource conditions which are consistent with the HNF Forest Plan and the Bureau of Land Management (BLM) Butte Field Office (BFO) Resource Management Plan (RMP). Other influences included Forest Plan goals, objectives, standards and

guidelines; BLM RMP objectives; and federal laws, regulations and policies. Within these parameters, the alternatives display a range of outputs, treatments, management requirements, design elements, and effects on resources.

Several alternative approaches to the proposed action are considered to meet the purposes and needs for action in the project area. Three alternatives are considered in detail, and are discussed throughout this document. The other alternatives were considered but not given detailed study and are discussed briefly below.

40 CFR 1502.14 (e) states that agencies shall identify an alternative or alternatives, if one or more exists, in the draft statement and identify such alternative in the final statement unless another law prohibits the expression of such a preference. A preferred alternative has not been identified by the Forest Service or BLM at this time. The final statement will display the identified preferred alternative.

Alternatives Considered in Detail

The following section describes the No Action alternative and two action alternatives considered in detail. All alternatives would comply with all valid statutes on National Forest Service (NFS) and BLM lands. Impacts to resources are considered through the National Environmental Policy Act (NEPA) of 1969.

For an alternative to be analyzed and considered in detail, it must respond to the purpose and need for action and significant issues as described in Chapter 1. This document has three alternatives that were analyzed in detail.

Maps of the action alternatives are located in appendix E of this DEIS.

Alternatives at a Glance

The following tables provide an overview of treatments, methods, road activities, burning activities and watershed improvement activities proposed across the project area on both Forest Service and Bureau of Land Management lands.

Table S-2. Proposed treatments on Forest Service and BLM lands combined and associated acres by alternative.

Treatment Type (FS and BLM Combined)		Prescription	Alt. 1 Acres	Alt. 2 Acres	Alt. 3 Acres
Commercial Removal of Fuels	Improvement Harvest	Improvement Cut followed by jackpot burn or underburn	0	2,483	1,382
	Regeneration Harvest	Clearcut with Leave Trees and site prep burn	0	3,573	2,348
		Seed Tree with Leave Trees and site prep burn	0	298	0
		Shelterwood with Leave Trees and site prep burn	0	363	102
Non-Commercial Removal or Rearrangement of Fuels	Prescribed Fire	Shaded Fuel Break (handpile burn, jackpot burn or underburn)	0	1,415	1,282
		Low Severity Grassland Prescribed Fire (jackpot or handpile burn)	0	0	1,662
		Low Severity Prescribed Fire (jackpot burn or underburn)	0	11,900	7,952
		Mixed Severity Prescribed Fire (broadcast Burn)	0	1,714	656
	Private Land Buffers	Mechanical/Hand Pile Burn or jackpot Burn	0	2,091	2,283
	Precommercial Thin	Precommercial Thin with handpile burn or Jackpot burn	0	471	445
Total			0	24,308	18,112

Table S-3. Proposed road activities and associated acres by alternative.

Road Activity	Alt. 1 Miles	Alt. 2 Miles	Alt. 3 Miles
FS New Temporary Road Construction/Decommissioning	0	39	21
BLM New Temporary Road Construction	0	4	3
Road Decommissioning	0	15	15
Road Reconstruction	0	32	28
Road Maintenance	0	6	4

Table S-4. Proposed watershed improvement activities by alternative.

6th-HUC drainage	# of existing undersized or damaged culvert	# of culvert replaced to pass at least the 25-year flood event	Alt. 1	Alt. 2	Alt. 3
Lump Gulch	7	7	No	Yes	Yes
Last Chance Gulch	1	1	No	Yes	Yes
Upper Tenmile Creek	9	9	No	Yes	Yes

Table S-5. Proposed watershed improvement activities by alternative.

Activity	Existing Condition	Summary of Work	Alt. 1	Alt. 2	Alt. 3
Restoration of wetland along Forest Service System Road 299	The wetland at T9N R5W Section 34 above (north of) the road along Beaver Creek would be restored and road 299 in that vicinity improved to allow surface and groundwater to pass without impacting the road surface.	Filling a drain ditch to restore the wetland water elevation to natural levels, installing appropriate drainage under the roadway, and raising the road surface elevation to improve the running surface and reduce maintenance requirements.	No	Yes	Yes
Reroute of Forest Service System Road 299 (approximately 2000 foot section)	This segment of road 299 traverses a wetland, and is frequently wet, rutted, and in generally poor condition. The road also contributes to the existing condition of the adjacent watershed discussed above.	Relocating this segment roughly 300 feet upslope in order to restore the wetland currently crossed by the road, improve road conditions, and reduce maintenance needs. This work would also compliment the wetland restoration work discussed above.	No	Yes	Yes
Westslope Cutthroat Trout restoration	Non-native trout in Moose Creek and lower Minnehaha Creek.	Work would entail removing non-native species above existing barrier structures in Moose Creek and lower Minnehaha Creek by mechanical methods such as electrofishing, and reintroduce native westslope cutthroat trout.	No	Yes	Yes

Alternative 1, No Action

Alternative 1 is the no action alternative and describes the existing condition. Under this alternative, no treatments would occur. The no action alternative provides the resource specialist a means for evaluating the current ecosystem conditions as a baseline.

The Council on Environmental Quality regulations (40 CFR 1502.14d) requires that a “no action” alternative be analyzed in every EIS. This does not mean that nothing would occur under this alternative. Under the no-action alternative current management plans would continue to guide management of the project area. Ongoing work or work previously planned and approved, such as, but not limited to, routine road maintenance, weed spraying, trail maintenance, and firewood gathering would still occur. None of the actions proposed in any of the other alternatives would occur.

Alternative 2, Proposed Action

The proposed action is designed to meet the purpose and need of maintaining consistent quantity and quality of water within the municipal watershed and improving conditions for public and firefighter safety across the landscape in the event of a wildfire. These are the conditions that would allow for safer, more aggressive, and likely more successful suppression response in the event of a wildfire (see alternative 2 map in appendix E of this DEIS).

Additionally, watershed improvement and road activities are proposed under this alternative. These activities would help improve water quality and aquatic habitat conditions in project area streams, including streams that deliver water to the City of Helena's municipal water supply intakes by addressing anthropogenic sources of sediment.

This alternative was designed with input from the public, collaborative groups, multiple agencies as well as resource specialists on the project's interdisciplinary team. Further refinement of alternative 2 occurred between scoping and this DEIS as a result of comments received on the project during scoping and additional internal review. Some units were modified, dropped from further consideration, or relocated. These changes were made in response to public concerns, access constraints, and further field verification.

The following features are included in alternative 2:

- To facilitate the removal of fuels from the units, approximately 43 miles (39 miles on FS-managed land and 4 miles on BLM-managed land) of temporary road construction and approximately 627 ground based landings are proposed. All temporary road and landing construction would be decommissioned when harvest activities have been completed.
- To meet Best Management Practices (BMP) standards, approximately 38 miles of existing roads would be improved and/or maintained during the life of the project.
- Approximately 6,717 acres of fuel would be commercially removed from the project area as a result of regeneration and/or improvement harvest.
- Approximately 3,977 acres of fuel would be rearranged and burned by various treatment types within the project area such as pre-commercial thinning, shaded fuel breaks, and private land buffers.
- Approximately 13,614 acres of low and mixed-severity prescribed fire is proposed within the project area.
- To improve watershed conditions, water quality, and aquatic habitat conditions in the project area, 17 culverts would be upgraded to accommodate at least a 25-year flood event, a wetland would be restored along Forest Service System Road 299, a segment of Forest Service System Road 299 would be rerouted out of a wetland, and restoration of native westslope cutthroat trout would occur in two tributaries to Tenmile Creek.
- In addition to the above watershed improvements, approximately 15 miles of road would be decommissioned.

- Treatment within IRAs (Jericho Mountain and Lazyman Gulch IRAs combined) would total approximately 7,936 acres.

Alternative 3

Alternative 3 is designed to address the following significant issues presented in both internal and external scoping comments: treatments within Inventoried Roadless Areas, elk security and hiding cover, recreational trails, and temporary road construction (see chapter 1 for description of issues). Treatments were modified to address the above issues while still meeting the purpose and need for the project. Modifications were made within elk security areas, especially where some islands of healthy, mature trees still exist, and total treatment acres within IRAs were reduced. Mechanical treatment, including commercial harvest, would not occur within IRAs, with the exception of private land buffers within IRAs.

Watershed improvement and road activities proposed in alternative 2 are also proposed under this alternative. These activities would help improve water quality and aquatic habitat conditions in project area streams. When coupled with the reduction of treatment within elk security areas, more big game security objectives for this alternative would be met (see alternative 3 map in appendix E of this DEIS).

The following detailed features are included in alternative 3:

- To facilitate the removal of fuels, approximately 24 miles (21 miles on FS-managed lands and 3 miles on BLM-managed land) of temporary road construction and approximately 368 ground based landings are proposed. All temporary road and landing construction would be decommissioned when harvest activities have been completed.
- To meet Best Management Practices (BMP) standards, approximately 32 miles of road would be improved and/or maintained during the life of the project.
- Fuels on approximately 3,832 acres of land would be removed commercially from the project area through regeneration and/or improvement harvest methods.
- Fuels on approximately 4,010 acres of land would be rearranged and burned by various methods within the project area, including precommercial thinning, shaded fuel breaks, and private land buffer treatments.
- Approximately 10,270 acres of low and mixed severity prescribed fire is proposed within the project area.
- To improve watershed conditions, water quality, and aquatic habitat conditions in the project area, 17 culverts would be upgraded to accommodate at least a 25-year flood event, a wetland would be restored along Forest Service System Road 299, a segment of Forest Service System Road 299 would be rerouted out of a wetland, and restoration of native westslope cutthroat trout would occur in two tributaries to Tenmile Creek.
- In addition to the above watershed improvements, approximately 15 miles of road would be decommissioned.
- No commercial harvest would occur within IRAs (Jericho Mountain and Lazyman Gulch IRAs combined) under this alternative. Mechanical treatment in IRAs

would only occur within Private Land Buffers. Treatment within IRAs would total approximately 4,902 acres.

Terminology

To help the reader better understand the treatment descriptions included within the action alternatives, we have provided this section on commonly-used terminology. More definitions can be found in the glossary of the DEIS.

Silviculture

Improvement Harvest: Harvest designed to enhance growth, quality, vigor, and composition of a stand after establishment by thinning from below and removing overstory trees (i.e., “crown thinning”). Density, structure, and/or composition of the stand are altered. The stand maintains a forested appearance as substantial amounts of green, healthy large diameter trees would be retained in these dry or mixed forests within the project area. The potential for a crown fire is also reduced. A final harvest may or may not be conducted in the future depending on management goals.

Precommercial Thinning: Young plantations established from past harvest that are typically composed of small diameter trees and contain roughly 400 to 1,700 trees per acres. Treatment would be pre-commercial thinning in young stands established after past harvest leaving about 100 - 200 trees per acre of the best-formed trees. Species such as ponderosa pine, whitebark pine, and aspen would be favored where they occur. This would enhance growth and vigor and reduce the long-term risk of mountain pine beetle caused mortality. The limbs and tops of the fallen trees may be lopped and scattered to speed decomposition. Hand or machine piling and burning of piles would be completed where the fuel loading is an unacceptable risk.

Private Land Buffer: This treatment type is designed for citizens who have completed fuels reduction or defensible space treatment on their property. This treatment type is designed to extend treatments onto public lands where it meets land management objectives and is consistent with the analysis of this DEIS. Treatment includes hand and mechanical activities to rearrange and remove hazardous fuels and reduce crown fire potential by thinning trees. Treatment in the South Helena area could extend up to 100 yards from private boundaries onto NFS lands and up to 200 yards from private boundaries onto NFS and BLM lands in the Tennile area. These treatment units would be developed cooperatively between the landowner and the FS and would incorporate site-specific considerations such as slope, topography and vegetation. The FS would remain involved and oversee implementation.

Regeneration Harvest: Harvesting to create a new age class, resulting in uneven-aged, 2-aged, or even-aged stands. These harvests could include clearcutting, seedtree/shelterwood cutting, and single or group tree selection depending on the tree species and desired regeneration. For 1- or 2-aged systems, most of the overstory is removed and the stand is dominated by new regeneration. For 3-aged systems, only single trees or small groups are removed, with regeneration established in gaps.

Clearcut with Reserve Trees: Dead and dying lodgepole pine would be cut and removed. Most overstory trees would be removed. Leave trees may be retained for snags or structure; leave trees are defined site specifically with prescriptions.

All other live conifers would be retained when they occur; primarily Douglas-fir with spruce and subalpine fir. These units would naturally regenerate with lodgepole pine resulting in even-aged stands.

Seedtree with Reserve Tree: Dead and dying lodgepole pine trees would be removed. Well-distributed healthy Douglas-fir and ponderosa pine would be retained at a rate of about 10-20 trees per acre to provide seed for regeneration. Natural regeneration would be promoted, though ponderosa may be planted. A mix of lodgepole pine, Douglas-fir, ponderosa pine, and/or whitebark pine regeneration is expected that contributes to landscape diversity in species composition and density. The seed trees would be left as reserves.

Shelterwood with Reserve Tree: A mix of dead and dying lodgepole and other tree species would be cut except those needed to provide seed and shelter for regeneration. A group shelterwood would be left in a clumpy distribution. Most live trees would be retained at about 20-50 trees per acre in a clumpy distribution made up of mostly healthy Douglas-fir to provide seed and shelter for seedlings. Natural regeneration would be promoted, though planting may occur for species diversity.

Prescribed Burning is where fire is used as a treatment tool to accomplish a variety of goals, primarily fuels reduction and vegetation restoration. This category includes the rearrangement of fuels which includes the use of mechanized equipment for the removal of hazard trees, heavy concentrations of slash / jackstraw trees, and slashing understory vegetation prior to prescribed burning. No ignition buffers would be required adjacent to stream courses. Hand firelines (control lines) would be construction as needed.

The following burning activities are proposed throughout the Tenmile – South Helena project area.

Slashing: Cutting generally smaller diameter trees mechanically or with chainsaws. Slashing is used to reduce ladder fuels to lower crown fire potential; to create a sufficient surface fuels to carry a prescribed fire; and/or to add fuels to meet woody debris goals for nutrient cycling. Prescriptions may call for the retention of certain species (such as ponderosa or limber pine), or a desired spacing in order to meet target stand conditions.

Pile/Burn: Hand or mechanical piling of fuels, generally follows slashing or harvest where slash disposal is needed but broadcast burning is not feasible or desirable. Slash would generally be burned when conditions are favorable, after curing. Target amounts of slash may be left to meet woody debris and nutrient cycling goals.

Jackpot Burn: Jackpot burning would be conducted to consume concentrations of natural fuels and/or treatment-generated slash. Pre-positioning of fuels mechanically or by hand may be done to facilitate this activity. This activity may involve burning loose piles or areas of slash where fuels are not continuous. This would cause generally less than 10 percent mortality in the residual overstory, and burn patches would cover 30 to 50 percent of the ground surface.

Site Preparation burn: Burning following harvest where the bulk of the canopy was removed. The goal is to reduce logging slash and prepare the site for regeneration. It is a low to moderate intensity fire where direct and indirect mortality of leave trees is less than 5 percent (reserve, shelter, or seed trees left are minimal and a high priority to protect). The goals are to reduce fine woody debris (less than 3 inch diameter), reduce duff fuel loadings, expose 5 to 25 percent mineral soil, & retain most coarse woody debris (greater than 3 inch diameter) for nutrient cycling, seedling microsites, and wildlife habitat. Additional objectives include generating heat to open serotinous cones and reduce competing vegetation. Units targeting whitebark pine regeneration will have mixed severity effects; units targeting other species will have low severity effects.

Shaded Fuel Break: Shaded fuel breaks are hand or mechanical cutting of trees to increase canopy spacing to alter the fuel profile. Slash created would be handpiled and burned or jackpot burned where feasible to reduce surface fuel loadings. Shaded fuel breaks would vary in width depending on topography, aspect, slope, stand composition, and expected fire behavior adjacent to the fuel break.

Broadcast Burning: This is a larger-scale ‘Landscape Ecosystem Burn’ with goals of reducing hazardous fuels and restoring appropriate fire regimes to the landscape. These may include areas of:

Mixed Severity: This larger scale “Landscape Ecosystem Burn” is a mosaic of prescribed fire types and intensities resulting in a strategic landscape mosaic of fire effects – about 40 to 60 percent of each unit would be burned. Fire is used as a tool to achieve stand objectives with mixed severity. The purpose is to reduce ladder fuels and overstory tree density – heterogeneity in structure is desired. Overall mature tree mortality is generally 30 to 50 percent, occurring in patches. Other objectives include reduction of fine woody debris (less than 3 inch diameter) and duff fuel loadings. Limited amounts of mineral soil would be exposed (5 to 25 percent). Up to 30 percent of coarse woody debris (greater than 3 inch diameter) may be consumed but the remainder would be retained for nutrient cycling and wildlife habitat.

Low-Severity prescribed burning: Low-intensity prescribed burning will be used to improve dry forests and grass-shrub areas. In forest areas, savannah conditions would be created with understory ladder fuels and crown fire potential reduced by the treatments. In non-forest areas, encroaching conifers would be reduced. Mechanical and hand rearrangement of fuels will occur, with trees strategically slashed or thinned to facilitate prescribed burning. Direct mortality less than 5 percent, indirect mortality less than 10 percent, and less than one acre mortality patches may occur in the overstory. Objectives include reducing fine woody debris (less than 3 inch diameter), reducing duff fuel loading while minimizing exposure of soil (less than 10 percent), and retaining most coarse woody debris (greater than 3 inch diameter) for nutrient cycling and wildlife habitat.

Low-severity grassland prescribed burning: Low-intensity grassland prescribed burning will be used to improve grassland and grass-shrub areas. In these areas, encroaching conifers would be reduced. Mechanical and hand rearrangement of fuels will occur, with trees strategically slashed or thinned, slash created from these treatments would be handpiled and burned or jackpot burned.

Roads

Road Maintenance: The intention of road maintenance is to keep the road in a condition that meets BMP standards, minimizes impacts to water resources, and allows for safe timber haul. Road maintenance activities would include surface blading, vegetation removal, minor slump repair, and drainage structure cleaning and/or installation.

Road Reconstruction: The intention of road reconstruction is to improve road conditions to meet BMP standards, minimize impacts to water resources, and allow for safe timber haul. In addition to basic maintenance activities (listed above), reconstruction would also involve more significant roadway improvements, such as realignment, curve widening, or subgrade boulder or cobble excavation and removal.

Temporary Road Construction: Temporary roads for the Tenmile – South Helena Project would be improved or constructed to the minimum standard needed to provide access for harvesting equipment and log trucks while minimizing impact to water resources. These roads would be decommissioned after harvest activities are completed.

Haul Road: Road used during project implementation to haul wood products.

Road Decommissioning: For the Tenmile – South Helena Project decommissioning refers to full obliteration of the road: recontouring (returning the road prism to natural contour), removing culverts, replacing topsoil, placing woody debris upon the disturbed area to provide stability, and seeding the disturbed area.

Alternatives Considered but Not Given Detailed Study

Federal agencies are required by the Council on Environmental Quality (CEQ) to rigorously explore and objectively evaluate reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14 (a)).

Public comments received during scoping provided suggestions for alternative methods for achieving the purpose and need for action. Some of these alternatives were outside the scope of the purpose and need for action, similar to the alternatives considered in detail, or were determined to cause unnecessary impacts. Therefore, a number of alternatives were considered but dismissed from detailed study for reasons summarized below.

No Burning

A few comments were received that expressed concern about the effects of smoke produced by prescribed fire on air quality in and around the City of Helena. Another related concern to prescribed fire had to do with how prescribed fire activities would be accomplished within allowable times to burn given the amount of prescribed fire proposed and limited time burning is allowed within air-sheds. To address these

concerns the interdisciplinary team considered an alternative that would eliminate prescribed burning in all units in the Tennile – South Helena project area. Upon review of a no burning alternative and based on the best available science and data, the team found that it would be unlikely to reduce the probability of high-severity wildfire, create a mosaic of vegetation and fuel structure, and improve conditions for public and firefighter safety across the landscape in the event of a wildfire. The proposed fuel reduction techniques focus on reducing the potential for crown fires and high intensity surface fires in treatment units through the use of vegetation and prescribe fire treatments. The combination of these efforts will move treated units closer to historical conditions by creating a mosaic of age class, stand structure, and reintroduction of fire. Reinhardt et al (2008) found that it is possible to craft treatments that achieve both ecological restoration and fire hazard reduction, but ecological restoration will also include reintroducing fire and other active management. The most effective treatments should include prescribed fire (Reinhardt et al 2008). In doing so, treating the proposed areas with prescribed fire will reduce existing and future hazards to firefighters and the public. Furthermore, implementation of the alternatives, as demonstrated in the smoke modeling with incorporated design features, would be in compliance with the land management plans and complying with air quality standards by not causing or contributing to any exceedances or violations of Federal or State standards and by cooperating with the Montana Air Quality Bureau in the Prevention of Significant Deterioration (PSD) program and State Implementation Plan (SIP).

No New Road Construction Including Temporary Roads

Several comments requested an alternative that would not include the construction of any new roads. As part of the action alternatives, temporary roads would be constructed for the purpose of removing hazardous fuels from strategically located units. The interdisciplinary team assessed locations where hazardous fuels could be removed using only existing roads. In doing so, the team found that fuel removal would not be feasible in areas adjacent to private property around the community of Rimini, Buffalo Creek, and Whiteman Gulch as well as within portions of the Upper Tennile Creek municipal watershed. The team also considered utilizing only hand methods and prescribed fire, but found that rearranging fuels by these methods alone would not meet resource objectives. Without the use of a temporary road system, treatment would not occur within these areas and would therefore limit the project from effectively modifying fuel behavior and restoring heterogeneity to the extent needed to reduce the probability of high-severity wildfires and their associated detrimental watershed effects in the Tennile Municipal Watershed and surrounding areas. Furthermore, conditions for public and firefighter safety would not be improved and a mosaic of vegetation and fuel structure more resilient to disturbance would not be created.

No Treatment in Inventoried Roadless Areas (IRA)

Several comments were received requesting an alternative that would not have treatments within Jericho Mountain and Lazyman Gulch IRAs. Under this alternative, there would be no treatments proposed within IRAs. Failure to treat strategic locations within the IRAs would not reduce the risk to important values and critical infrastructure that this project is intended to address. Furthermore, opportunities to manipulate fuels structure to improve conditions for public and firefighter safety across the landscape would be

constrained across a large part of the project area. In the event of a wildfire within the IRAs, fire management staff would likely be compelled to restrict ground crew response due to safety concerns related to snags and inadequate escape routes to safety zones as a result of the continuous layers of fallen dead trees. Furthermore, the probability of successfully protecting important values and infrastructure such as the municipal watershed, public safety and property, soil and water resources would be low.

Build Water Filtration System for the City of Helena

A comment was received requesting an alternative be developed that would examine building a water treatment plant that can handle the increase in sediment caused by wildfire in Helena's watershed. As is discussed in the draft EIS and hydrology specialist report, wildfires can impact water quality in a variety of ways, many of which are difficult or expensive to handle by water treatment plants. High turbidity and sediment loads are likely concerns, though increases in other contaminants also pose problems. While construction of water treatment facilities for a municipality is outside of the Forest Service's mandates, the City of Helena spoke with specialists from the consulting firm CH2M-Hill to investigate the feasibility of adding a sediment-reducing treatment component to the Tennmile Water Treatment Plant. This option was determined by the City to be unfeasible due to high construction and operational expenses.

Only Create Buffers around the IRAs and Private Property

Several comments were received requesting treatments be limited to buffers around IRAs and/or private property. As mentioned above, treatment units have been strategically located in order to effectively meet the purposes of the project to improve conditions for public and firefighter safety across the landscape in the event of a wildfire and to maintain a consistent quantity and quality of water within the municipal watershed. Limiting treatments to buffers around IRAs and/or private property would fail to address firefighter and public safety in the event of a wildfire across a large part of the project area. Furthermore, this alternative would eliminate the majority of strategically located units at the landscape scale designed to achieve a mosaic of vegetation and fuel structure more resilient to disturbance which would provide for safer, more effective fire suppression actions.

Eliminate Units (with roads and noxious weeds present) from Fire Management Proposals

One commenter asked for an alternative to be developed "that eliminates units that have noxious weeds present on roads within units from fire management proposals." Because weeds are generally present along almost all roads within the project area this would essentially eliminate fire management from all units in which it is proposed. Eliminating all fire treatments from the project would not meet fuels and site preparation objectives and also would not meet purpose and need objectives, as described in the "no burn" entry above.

Expand Treatments West of the Continental Divide

The area west of the Continental Divide is outside the project area. Adding treatments to the west would change the nature and scale of the project and would therefore be out of

the scope of this project. However, other projects, such as the Telegraph Vegetation Project, are considering treatments west of the Divide.

No Site-Specific Amendment

Based on comments received, the Helena – Lewis and Clark National Forest considered an alternative which would not require a site-specific amendment to forest-wide or management area standards. Analysis demonstrates action alternatives as proposed would result in a quicker attainment of habitat components associated with big game standards as a result of rapid regeneration as compared to the no action alternative that could take a longer amount of time. Additionally, a large portion of the project area is mapped winter range in which the Forest Plan requires that all winter ranges be closed to vehicles between December 1 and May 15. Without amending this standard, timing of implementation would be limited to outside the December 1 to May 15 window which would limit the project's ability to timely implement proposed activities. This would result in extending the duration it would take to achieve project goals and consequentially result in higher implementation cost especially considering that a large part of the project area is located within winter range. Also, operating mechanical equipment during the winter when the ground is frozen or covered in snow greatly reduces potential impacts to soils and the spread of noxious weeds. Prescribed burning activities during the spring (prior to May 15) would also be eliminated under a no amendment alternative. The ability to perform prescribed burning during the spring allows for extended burning window opportunities. Weather and fuel conditions during other times of the year are typically not suitable for performing prescribed burns. Also, a site-specific amendment for forestwide standard 4a would be required for both action alternatives. Analysis indicated that the Helena – Lewis and Clark National Forests does not have jurisdiction over a sufficient amount of open roads in the Quartz Creek Elk Herd Unit to influence road closures and achieve consistency with Standard 4a. To this end, a no amendment alternative was not considered further. See the Tenmile – South Helena Wildlife Specialist report for additional information regarding the proposed site-specific Forest Plan amendment to standards.

Comparison of Alternatives

This section provides a tabular summary of the effects of implementing each alternative. The tables² display Purpose and Need, Key Issues, and Resource Measurement Indicators by alternative. The action alternatives address key issues to varying degrees, dependent upon specific alternative design elements.

Table S-6. Purpose and need indicators by alternative

Purpose and Need Indicators	Alternative 1 (Existing Condition)	Alternative 2	Alternative 3
Project area treated – percent and acres	0	40 / 24,308	30 / 18,112
Miles of road decommissioned	0	15	15
Number of damaged or undersized culverts replaced	0	17	17
Net acres of wetland restored in Upper Tenmile Creek drainage	0	18	17.5

Table S-7. Significant issues by alternative

Issues	Alternative 1 (Existing Condition)	Alternative 2	Alternative 3
<i>Inventoried Roadless Area</i>			
Jericho Mountain IRA acres treated	0	3,944	1,462
Lazyman IRA acres treated	0	3,992	3,440
<i>Elk security and hiding cover</i>			
<i>Acres and percent of hiding cover</i>			
Black Mountain-Brooklyn Bridge Elk Herd Unit	30,608 / 56%	19,902 / 37%	22,108 / 41%
Jericho Elk Herd Unit	25,810 / 73%	18,556 / 53%	21,786 / 62%
Quartz Elk Herd Unit	20,849 / 57%	19,415 / 53%	20,061 / 55%
<i>Acres of hiding cover in security areas</i>			
Black Mountain-Brooklyn Bridge Elk Herd Unit	4,833	3,826	3,996
Jericho Elk Herd Unit	3,139	1,498	2,365
Quartz Elk Herd Unit	0	0	0
<i>Acres of hiding cover in intermittent refuge areas</i>			
Black Mountain-Brooklyn Bridge Elk Herd Unit	1,534	864	1,239
Jericho Elk Herd Unit	863	863	863
Quartz Elk Herd Unit	981	907	981

² Incorporates all design features/mitigation measures

Issues	Alternative 1 (Existing Condition)	Alternative 2	Alternative 3
% Hiding cover /open road density mi/mi^2 during the hunting season by elk herd unit Post and (during Implementation)			
Black Mountain-Brooklyn Bridge Elk Herd Unit	0.8	0.8 (1.14)	0.8 (1.05)
Jericho Elk Herd Unit	1.3	1.3 (1.45)	1.3 (1.47)
Quartz Elk Herd Unit	1.1	1.1 (1.21)	1.1 (1.14)
Road Activity (miles)			
Temporary Road Construction followed by decommissioning	0	43	24
Road maintenance	0	6	4
Road reconstruction	0	32	28
Haul routes	0	38	32
Recreation			
Miles of trail within treatment units	0	25	23

Table S-8. Resource measurement indicators by alternative

Resource (measurement indicator)	Alternative 1 (Existing Condition)	Alternative 2	Alternative 3
Hydrology/Aquatic Organisms by 6 th – HUC drainage			
Equivalent Clearcut Acres on NFS land within project area			
Lump Gulch	4,629	5,118	4,875
Middle Prickly Pear Creek	2,459	2,494	2,459
Last Chance Gulch	1,613	1,906	1,901
Upper Tenmile Creek	3,177	4,306	4,139
Middle Tenmile Creek	2,566	2,729	2,667
Lower Tenmile Creek	1,732	1,765	1,761
Sedimentation from treatment units (tons, probability of sedimentation in the first year after treatment)			
Lump Gulch	N/A	0.1	0.0
Middle Prickly Pear Creek	N/A	0.0	0.0
Last Chance Gulch	N/A	0.1	0.1
Upper Tenmile Creek	N/A	0.4	0.1
Middle Tenmile Creek	N/A	0.9	0.1
Lower Tenmile Creek	N/A	0.1	0.1
Sedimentation from Roads (average tons/year)			
Lump Gulch	1.7	1.1	1.1
Middle Prickly Pear Creek	--	--	--
Last Chance Gulch	3.7	1.4	1.4
Upper Tenmile Creek	14.0	2.2	2.2
Middle Tenmile Creek	--	--	--
Lower Tenmile Creek	--	--	--

Resource (measurement indicator)	Alternative 1 (Existing Condition)	Alternative 2	Alternative 3
<i>Road decommissioning (miles decommissioned within 150 feet of stream)</i>			
Lump Gulch	0	0.1	0.1
Middle Prickly Pear Creek	0	0	0
Last Chance Gulch	0	0	0
Upper Tenmile Creek	0	1.8	1.8
Middle Tenmile Creek	0	0	0
Lower Tenmile Creek	0	0	0
<i>Wetlands restored/impacted (net acres restored)</i>			
Upper Tenmile Creek	0	17.0	16.5
<i>Vegetation</i>			
<i>Vegetation Types – Percent and acres of total treatments</i>			
Proposed treatments in <i>Douglas-Fir and ponderosa pine</i> dry warm vegetation types – percent / acres of total treatments	0	63 / 15,780	59 / 9,808
Proposed treatments in <i>Lodgepole pine and mixed conifer</i> cool-moist vegetation types – percent / acres of total treatments	0	37 / 8,528	31 / 5,158
Proposed Treatment in <i>Grassland</i> warm and dry vegetation types – percent / acres of total treatments	0	0	10 / 1,662
<i>Snags/ac in Third Order Drainages (post treatment)</i>			
Drainage 1001-1	100	78	78
Drainage 1001-2	195	91	172
Drainage 1001A	206	194	196
Drainage 0814	71	58	63
Drainage 0809C	35	34	35
<i>Fuels</i>			
Tenmile Watershed - 38,674 acres (Percent of area treated)	0	38	29
Flame length (Percent change in flame length / Feet)	Treatment Type		
	Improvement Harvest	NA / 7.3	59.7 / 2.9
	Clearcut with Leave Trees	NA / 21.4	67.2 / 4.3
	Shelterwood with Leave Trees	NA / 16.7	82.7 / 5.9
	Shaded Fuel Break	NA / 4.0	34.9 / 5.4
	Low Severity Grassland Prescribed Fire	NA / 4.4	57.8 / 1.9

Resource (measurement indicator)		Alternative 1 (Existing Condition)	Alternative 2	Alternative 3
	Low Severity Prescribed Fire	NA / 6.6	58.1 / 2.6	60.6 / 2.6
	Mixed Severity Prescribed Fire	NA / 3.0	72.9 / 1.6	43.3 / 1.7
	Private Land Buffers	NA / 10.9	66.1 / 3.8	66.1 / 3.7
	Precommercial Thin	NA / 15.8	78.1 / 3.3	76.6 / 3.7
Percent change in fireline intensity / Fireline Intensity (BTU/FT/S)	Treatment Type			
	Improvement Harvest	NA / 501.5	75.7 / 120.1	69.5 / 153.0
	Clearcut with Leave Trees	NA / 1892.8	81.1 / 175.1	88.1 / 225.2
	Shelterwood with Leave Trees	NA / 1333.4	89.1 / 322.1	85.4 / 194.7
	Shaded Fuel Break	NA / 187.4	56.0 / 247.4	66.2 / 63.4
	Low Severity Grassland Prescribed Fire	NA / 194.8	82.9 / 39.0	43.4 / 110.3
	Low Severity Prescribed Fire	NA / 447.4	79.7 / 79.5	79.9 / 90.1
	Mixed Severity Prescribed Fire	NA / 118.6	94.8 / 17.9	82.6 / 20.6
	Private Land Buffers	NA / 851.3	71.4 / 253.9	71.2 / 245.0
	Precommercial Thin	NA / 1275.2	87.1 / 156.4	84.0 / 203.5
Noxious Weeds				
<i>Predicted increase in acres of potential noxious weed infestations resulting from proposed activities.</i>		0	3,494	2,564
Wildlife ³				
Elk				
<i>Elk habitat effectiveness on summer range (Post and During Implementation)</i>				

³ Also includes elk significant issue measurement indicators

Resource (measurement indicator)	Alternative 1 (Existing Condition)	Alternative 2	Alternative 3
Black Mountain-Brooklyn Bridge Elk Herd Unit	65/NA	65/56	65/58
Jericho Elk Herd Unit	56/NA	56/52	56/51
Quartz Elk Herd Unit	58/NA	58/53	58/56
<i>% Hunting season elk security by elk herd unit post and during project implementation</i>			
Black Mountain-Brooklyn Bridge Elk Herd Unit	16/NA	16/13	16/15
Jericho Elk Herd Unit	12/NA	12/12	12/12
Quartz Elk Herd Unit	0/NA	0/0	0/0
<i>% Hunting season intermittent refuge areas by elk herd unit post and during project implementation</i>			
Black Mountain-Brooklyn Bridge Elk Herd Unit	5/NA	5/3	5/5
Jericho Elk Herd Unit	3/NA	3/3	3/3
Quartz Elk Herd Unit	5/NA	5/3	5/5
<i>% Elk thermal cover by elk herd unit on winter range</i>			
Black Mountain-Brooklyn Bridge Elk Herd Unit	17	13	15
Jericho Elk Herd Unit	25	8	9
Quartz Elk Herd Unit	16	13	13
<i>Lynx</i>			
<i>% Lynx Analysis Unit (LAU) in early stand initiation habitat</i>			
LAU di-04	3	3	3
LAU di-05	3	14	11
LAU di-06	1	4	2
<i>% Lynx Analysis Unit (LAU) in stand initiation hare habitat</i>			
LAU di-04	10	10	10
LAU di-05	2	1	1
LAU di-06	6	6	6
<i>% Lynx Analysis Unit (LAU) in multistory hare habitat</i>			
LAU di-04	32	32	32
LAU di-05	26	22	23
LAU di-06	37	36	37
<i>Other Wildlife Species</i>			
Acres of potential Northern Goshawk habitat (Nesting) in the project area	24,313	19,894	21,541
Acres of improved large ponderosa stands (improved flammulated owl habitat)	0	2,726	2,211

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CHAPTER 1. PURPOSE OF AND NEED FOR ACTION

Document Organization

The Tennmile – South Helena Project Draft Environmental Impact Statement (DEIS) is a site-specific effects analysis of management activities proposed in the Tennmile – South Helena landscape on the Helena Ranger District of the Helena – Lewis & Clark National Forest (HLCNF) and portions of the Butte Field Office Bureau of Land Management lands (BLM) publicly administered lands. The Forest Service in cooperation with the BLM (40 CFR 1501.6) has prepared this DEIS in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. This DEIS discloses the direct, indirect, and cumulative environmental impacts that would potentially result from proposed activities on Forest Service and BLM lands under each alternative in addition to determining any irreversible and irretrievable commitment of resources that would result from the actions proposed to address forest health, watershed restoration, and fuels management goals of the Helena National Forest (HNF) Plan, as amended (1986) and the BLM – Butte Field Office – Resource Management Plan (2009). This DEIS is prepared according to the format established by Council on Environmental Quality (CEQ) regulations to implement the NEPA found in 40 CFR 1500-1508. This includes establishing the Butte Field Office of the Bureau of Land Management as a cooperating agency as specified by 40 CFR 1501.6.

This DEIS hereby incorporates by reference the project record (40 CFR 1502.21) and the Helena National Forest Plan (1986), as amended; the Forest Plan Final Environmental Impact Statement (FEIS) and Appendices; and the BLM – Butte Field Office – Resource Management Plan (2009). The project record contains specialist reports and other technical documentation used to support the analysis and conclusions in this DEIS specifically for the Tennmile – South Helena project.

The Forest Service uses the most current and complete data available. GIS data and product accuracy may vary. They may be developed from sources of differing accuracy, accurate only at certain scales, based on modeling or interpretation, incomplete while being created or revised, etc. Due to rounding, acre totals are approximate. Using GIS products for purposes other than those for which they were created may yield inaccurate or misleading results. The Forest Service reserves the right to correct, update, modify or replace GIS products without notification.

This document is organized into four chapters and appendices section:

Chapter 1. Purpose and Need for Action

This chapter includes introductory information on the background and history, the purpose of and need for management and the agency's proposal for achieving the purpose and need in the Tennmile – South Helena landscape. This section also details the regulatory framework for this project, Helena National Forest Plan

direction, decisions to be made, how the Forest Service informed and involved the public in the development of the proposal and how the public responded.

Chapter 2. Alternatives Considered

This chapter provides a detailed description of the alternative methods developed for achieving the stated Purpose and Need of the project (including the no-action alternative). These alternatives were based on key issues raised by the Interdisciplinary Team (IDT), other agencies, and/or the public during scoping. This chapter also includes a summary of terminology used to describe the proposed action. Design Criteria intended to reduce potential impacts to specified resource areas are also identified. Finally, this section provides summary comparison tables of the alternatives and their effects.

Chapter 3. Affected Environment & Environmental Consequences

This chapter describes the natural and human environments potentially affected by the proposed action and alternatives, and discloses anticipated potential effects of these actions. This chapter is organized by resource area.

Chapter 4. Consultation and Coordination

This chapter provides, list of preparers and agencies consulted during the development of the environmental impact statement followed by a glossary, list of acronyms, literature cited and index of key terms used throughout the DEIS.

Appendices

The Appendices provide more detailed information to support the analyses presented in the draft EIS. Appended materials in this document include a proposed unit-by-unit treatment summary (Appendix A), a Forest Plan consistency table (Appendix B), cumulative effects information (Appendix C), the appendices for the wildlife section (Appendix D), a map section (Appendix E), and appendices to the Heritage and Cultural Resources section (Appendix F).

Additional Documentation

Additional documentation, including more detailed analyses of the resources in the area, is found in the project files, located at the Helena Ranger District office, 2880 Skyway Drive, Helena, Montana 59602. Project file documents are available for review by contacting the project leader (contact information for the project leader is provided in the abstract of this document).

Introduction

The Tennile—South Helena Project area covers approximately **61,395** acres in Lewis and Clark, Powell, and Jefferson Counties. This includes approximately **49,546** acres of National Forest System (NFS), **1,043** acres of public lands administered by the Bureau of Land Management (BLM), and remaining acres are private lands or other state and local jurisdictions. No treatments are proposed on private land or other jurisdictions in this project. The project area is also defined by two contiguous areas on the landscape: the

western half of the project area, the Upper Tenmile watershed and the eastern half of the project area, the South Hills area of Helena, Montana.

Two Inventoried Roadless Areas (IRA) are also located within the Tenmile – South Helena project area (Jericho Mountain IRA and Lazyman Gulch IRA). The Jericho Mountain IRA is 8,440 acres and the Lazyman Gulch IRA is 11,605 acres. Approximately 80 percent or 6,735 acres of the Jericho Mountain IRA lies within the project boundary. The entire Lazyman Gulch IRA lies within the project boundary. Private land inholdings are located within both IRAs and are not accounted for in the above IRA acres.

This proposal describes activities on Helena National Forest Service lands in the following drainages: Upper Tenmile Creek, Middle Tenmile Creek, Lower Tenmile Creek, Lump Gulch, Last Chance Gulch and Middle Prickly Pear Creek; and on BLM lands in Colorado Gulch and south of Helena in Last Chance Gulch. The project is located within all or part of sections T10N, R6W Section 36; T10N, R5W Section 31; T10N, R4W Sections 31, 32, 34, 35, 36; T9N, R6W Sections 1, 2, 11, 12, 13, 23, 24, 25, 26, 35, 36; T9N, R5W Sections 1, 6-36; T9N, R4W Sections 1-24, 26-35; T8N, R6W Sections 1, 2, 11-14, 23-26; T8N, R5W Sections 1-12, 14-22, 29, 30; T8N, R4W Sections 5-8.

The Project is intended to improve conditions for public and firefighter safety across the landscape in the event of a wildfire, as well as to maintain consistent quantity and quality of water within the City of Helena's Tenmile municipal watershed. Additionally, the project is meant to move the resource area toward desired conditions and designed to respond to the goals and objectives outlined in the Helena National Forest Plan as amended (USDA, Forest Service 1986) as well as the BLM Butte Field Office Resource Management Plan (RMP) (2009). The Forest Plan defines the general management direction for all Helena National Forest (HNF) resource areas. It provides both Forest-wide and area-specific goals, standards, and guidelines. The BLM Butte Field Office RMP provides a comprehensive land use plan to guide management of public lands administered by the Butte Field Office. The RMP provides goals, objectives, allowable uses, and management direction to maintain, improve, or restore resource conditions and to provide for the long-term economic needs of local communities.

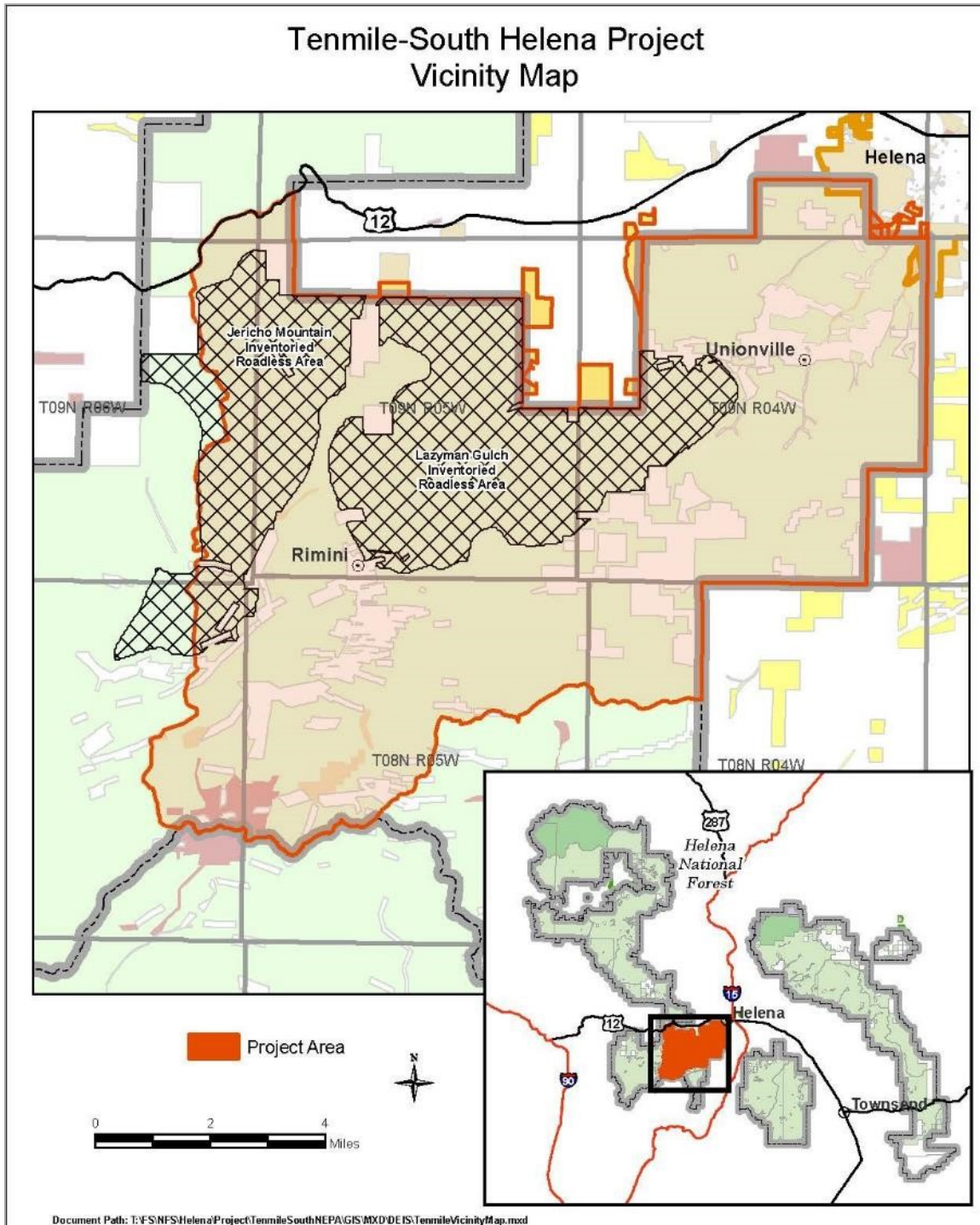


Figure 2. Tenmile – South Helena Vicinity Map

Background

Heavy fuel accumulations and dense forest stands exist throughout the project area as a result of decades of effective fire suppression, limited management activities and ongoing insect and disease mortality. These conditions cause an increased risk of landscape-scale wildland fires and their associated effects. In the event of a wildfire in the project area during typical summer conditions, suppression would likely be difficult and the probability of successfully protecting important values and infrastructure would be low. Such a fire would pose risk to firefighter safety, public safety and property, critical City of Helena water supply infrastructure, soil and water resources, wildlife habitat, and other important values.

Communities located within and adjacent to the project boundary have been identified by the Tri-County Community Wildfire Protection Plan as communities at risk of being impacted by wildfire due to their close proximity to extensive hazardous fuel accumulations on adjacent public lands. These communities include Unionville, Rimini, and the City of Helena. At-risk critical infrastructure exists in the project area and includes private property, structures, roads, utility corridors, City of Helena water supply, and communication system components.

In addition to the City of Helena, local residents, partners, and other agencies have expressed similar concerns. Given the existing condition, concerns expressed by a broad constituency in the area, and in keeping with the Forest Plan direction and its goals, the Helena National Forest Interdisciplinary Team identified the purposes and needs for the project area.

The purpose and need for action is determined by the extent and magnitude of differences between the existing and desired conditions on the landscape. Where there is little difference between these two conditions, the need for action is low. However, the difference between existing and desired conditions in the analysis area was determined to be large, and the need for action compelling.

Forest Vegetation and Fuel Conditions

Fire was historically the predominant natural disturbance in the Northern Rockies, including the Tenmile – South Helena project area; lightning ignitions largely determined where and when fires started (Agee 1993; Baker 2002; Pyne 1982) while indigenous burning is presumed to have occurred at lower elevations within the project area (Kimmerer and Lake 2001). Low elevation dry forests in the Northern Rockies have experienced changes in disturbance processes, structure, and function. Causes of change include fire suppression, forest management, and climate change (Hessburg and Agee 2003; Hessburg et al. 2005; Westerling et al. 2006). Changes include higher tree density, more multi-storied stands and ladder fuels, and a greater homogeneity of structures across the landscape. This in turn results in a greater probability for disturbances to affect large contiguous areas (Hessburg et al. 2005). Forest types with naturally high fire frequencies and mixed severity regimes—primarily ponderosa pine and Douglas-fir—have been altered substantially (Hessburg et al. 2005). The forest conditions described by research in the Northern Rockies are observed in the forest

vegetation within the project area. Fire in dry forests has shifted from low-intensity, high-frequency regimes to moderate and high-severity regimes, with consequent increases in uncharacteristic large-scale stand-replacing fires (Lehmkuhl et al. 2007). Landscapes are increasingly homogeneous in composition and structure, and the regional landscape is set up for severe, large fire and insect disturbance events (Hessburg et al. 2005). The role of fire as a stand replacement agent becomes more pronounced when the natural fire-free interval is increased through fire suppression.

The Divide landscape, where the Tenmile – South Helena project is located, historically would have burned an average of roughly 39,000 to 170,000 acres per decade (Hollingsworth 2004). These fires would have included low to moderate-intensity fire in dry conifer fire groups and stand-replacing fire in moist conifer fire groups. Fire occurrence records indicate that no fires at this scale and intensity have occurred on this landscape in the last century. The lack of fire on the Divide landscape – principally a result of fire suppression efforts – has resulted in an altered mosaic of vegetation.

The vegetation conditions that exist today in the Tenmile Creek watershed (the western part of the project area) were shaped not only by fire suppression, but also climatic trends, large fires that occurred prior to settlement, and fuelwood cutting that occurred around the turn of the previous century to support the mining and railroad industries. Management activities have also influenced current vegetation conditions, but to a much smaller extent than the aforementioned factors. Fire history maps indicate that much of the area burned in large wildfires in 1889 and 1904 (USDA HNF 2008, Hatton 1904). Fuelwood cutting for the mining and railroad industries was also common around the turn of the century. The climate early in the 20th century when forests were re-establishing following these disturbances was generally cool and moist, conducive to forest growth. The landscape became characterized by relatively densely stocked stands dominated by even-aged lodgepole pine, with some subalpine fir and spruce at upper elevations and drier Douglas-fir dominated at lower elevations. With the exception of small fires that were suppressed, the homogeneity of this landscape has been largely unbroken. While stand replacement effects would have been typical, there would also have been mixed and low severity fires that left substantial remnant components. The limited areas of past harvest have regenerated and support young forested stands; today these areas stand out as “green forest” areas surrounded by dead and dying trees impacted by the mountain pine beetle (MPB).

The South Hills portion of the project area (the eastern part) is lower in elevation, and is a landscape of large grasslands and dry forests. Historically, many dry coniferous forests were shaped by frequent, low-intensity fire; this included the warm, dry as well as moist Douglas-fir habitat types of the Tenmile – South Helena project area. This disturbance regime sustained open, large-tree-dominated structures with diverse and productive understory communities (Arno 1980, Hessburg and Agee 2003). However, over the last century, fire suppression, livestock grazing, and high-grade logging, among other factors, have altered the structure and function of dry coniferous forests across much of western Montana, including the project area. Forest structure and composition has been most significantly altered with the lack of fire disturbance. The disruption of the natural fire intervals in the past several decades have resulted in higher-density, multi-layered stands of mostly one species, Douglas-fir. Dramatically higher stand densities and development

of ladder fuels (Covington and Moore 1994; Arno et al 1995; Peterson et al 2009) increase the risk of uncharacteristically severe wildfire (Everett et al 2000; Friederici 2003), bark beetle infestations (Fettig et al 2007), and in some areas such as the Tenmile – South Helena project area, successional replacement by shade-tolerant competitors (Fischer and Bradley 1987; Mutch et al 1993; Habeck 1994; McKenzie et al 2004).

Mountain pine beetle has been the most damaging insect to trees on the HNF in recent years. The MPB outbreak reached the peak of active infestation area in 2009 and has been subsiding since. On the HNF, MPB infestation peaked at roughly 585,600 acres in 2009 (Gibson 2009), covering over 60 percent of the administrative land base. While most of the trees killed were lodgepole pine, ponderosa and whitebark pine were also affected. Within the Tenmile – South Helena project area, most forested pine stands have experienced the effects of MPB.

Wildland Urban Interface (WUI)

The project area lies within the area analyzed in the Tri-County Community Wildfire Protection Plan (Tri-County CWPP). The first CWPP for Broadwater, Jefferson and Lewis and Clark counties was approved in 2005 and was designed to help the communities within these counties to clarify and refine priorities for the protection of life, property, and critical infrastructure in the wildland urban (WUI) interface. In 2014, the Tri-County FireSafe Working Group (TCFWG) came together to update and improve the 2005 CWPP while still meeting its original intent and goals. The 2015 Tri-County Regional CWPP follows the National Fire Plan and involved a collaborative process including Lewis & Clark County, Jefferson County, Broadwater

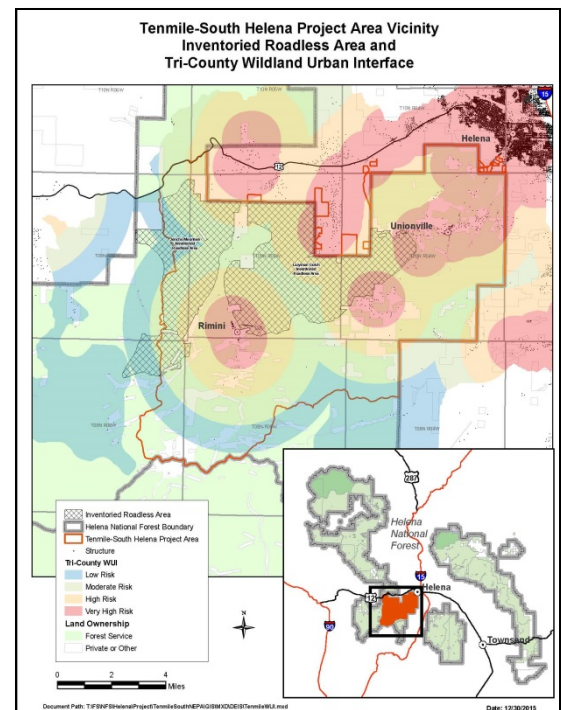


Figure 3. Tenmile – South Helena WUI

County, City of Helena, Montana Department of Natural Resources, Forest Service and the Bureau of Land Management, individual citizens, interested contractors and fire suppression departments. The TCFWG defined the WUI boundary as the area within four miles of communities that possess a population density exceeding 250 people per square mile. Projects proposed in the WUI would become a priority for accomplishment (2015 Tri-County CWPP). Roughly 97 percent of the Tenmile – South Helena project area has been designated in the CWPP as falling within a WUI zone. This includes the communities of Unionville, Rimini, and the City of Helena.

Tennile Municipal Watershed (City of Helena’s Municipal Water Supply)

Several headwater drainages in the Tennile Creek watershed serve as the primary source of municipal water for the City of Helena. Most of these drainages are within the Upper Tennile Creek 6th-Hydrologic Unit Code (6th-HUC) watershed, which has been identified by the Helena National Forest as a Priority Watershed for restoration.

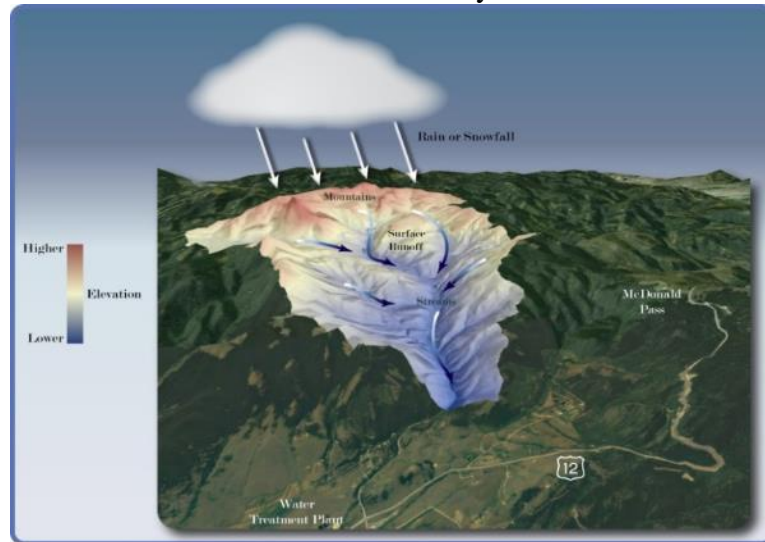


Figure 4. Upper Tennile Watershed – picture depicting hydrologic flow of the watershed

Purpose and Need for Action

Purpose

3. Maintain a consistent quantity and quality of water within the municipal watershed:
 - Reduce the probability of high-severity wildfires and their associated detrimental watershed effects in the Tennile Municipal Watershed and surrounding area
 - Reduce sources of sediment and other contaminants to water sources
4. Improve conditions for public and firefighter safety across the landscape in the event of a wildfire.

Need for Action

In order for this project to contribute to the above purposes, there is a need to:

- Create a mosaic of vegetation and fuel structure more resilient to disturbance which would provide for safer, more effective fire suppression actions and improve public safety. Reducing intensity of wildfires and increase fire suppression effectiveness would improve protection measures for the surrounding communities and key municipal watershed infrastructure. These actions would reduce the probability of post-wildfire watershed impacts in the Tennile municipal watershed.

- In addition, sources of anthropogenic sediment to streams need to be addressed in order improve water quality, watershed function, and other resource values in the project area.

The following sections discuss in greater detail the objectives related to these needs.

Maintain a consistent quantity and quality of water and reduce the probability of high-severity wildfires and their associated detrimental watershed effects in the Tenmile Municipal watershed and surrounding areas.

The combination of dead fuel and continuous live vegetation from the forest floor to the upper forest canopy has created a complex fuel type that, when ignited under severe fire conditions, would likely leave little or no surviving above-ground vegetation. In the event of a wildfire during typical summer conditions, detrimental effects to the watershed could include loss of canopy cover and associated impacts to riparian function, loss of the soil duff layer, soil water-repellency, greatly increased soil erosion from burned hillslopes, gully erosion and flooding, sedimentation of streams, other water quality impacts, and stream temperature increases.

A primary goal of this project is to maintain a consistent quantity and quality of water and reduce the probability of high-severity wildfire effects within the municipal watershed. In order to meet this purpose, there is a need to alter fire behavior in 20-40 percent of the watershed with strategically located units, assuming treated areas were selected in a manner that was informed by fire behavior modeling (Finney 2015).

The effectiveness of fuels treatments at modifying fire behavior is influenced by the location and spatial extent of those treatments. In the case of the Tenmile watershed, strategically located treatment of 20 to 40 percent of the landscape was predicted to effectively modify fire behavior to achieve desired outcomes, whereas randomly placed treatments would require a greater percentage to be effective (Finney 2015).

Create a mosaic of vegetation and fuel structure that is more resilient to disturbance.

A primary goal of this project is to create a mosaic of vegetation and fuel structure that is more resilient to disturbance which in turn would also provide for safer, more effective fire suppression actions. The action alternatives are designed to improve the heterogeneity across the project by creating patches and patterns that, to some extent, emulate natural fire which has been excluded from this ecosystem for a century. Proposed treatments would promote resilience to disturbance by creating a mosaic of stand densities, species composition, and age class. The various proposed treatment activities are designed to increase species diversity by providing growing space to seral species (ponderosa pine, lodgepole pine, whitebark pine and quaking aspen) within a forested landscape that is now dominated by Douglas fir and spruce due to the MPB epidemic. A resilient landscape is diverse so that not all areas are equally susceptible to the same disturbances at the same time.

Thinning some of the stands established after past harvest would also promote resilience, individual tree growth, and diversity of these younger forests that provide the primary green forests on a regenerating landscape. Encouraging a mosaic of reforestation would increase the potential that natural wildfires would burn at sizes and intensities more consistent with historic regimes. Removing beetle-killed lodgepole stands would alter the behavior and severity of potential future wildfires (Collins et al. 2012). This would help ensure that a full range of ecological and social values (i.e. reducing risk to the municipal watershed) are provided through time.

Improve conditions for public and firefighter safety across the landscape in the event of a wildfire.

This project proposes to strategically locate fuels reduction treatments in areas that would allow for safer, more efficient and direct initial attack of wildfire by suppression resources. Fuels reduction treatments proposed in this project area would result in a reduction in flame length and fireline intensity. The firefighting environment would be improved due to reductions in wildfire's resistance to suppression, reduced overhead hazards and reduction of dead and down trees.

Reduce sources of anthropogenic sediment and other contaminants to water sources.

Anthropogenic fine sediment is a listed contaminant in some streams within the Tenmile – South Helena project area. This water quality impairment is primarily a result of past mining activity, forest roads, and livestock activities. The project provides an opportunity to improve road-related conditions to reduce chronic sediment load in project-area watersheds by improving open roads, replacing undersized or failing culverts, re-routing a road that traverses a wetland, and decommissioning unneeded or unauthorized routes.

Scope of the Analysis

The proposed action is limited to specific fuel and vegetation treatments as well as watershed and aquatics improvement and road management activities proposed on National Forest System (NFS) and BLM administered lands in the Tenmile – South Helena Project area. The geographic extent of some areas used to analyze different resource components (i.e. watershed, fuels and wildlife home range) may extend beyond the project area. The analysis of effects disclosed in this document includes those occurring from the entire “scope” of the decision. Scope is defined in 40 CFR 1508.25 as the range of actions, alternatives, and impacts to be considered in an EIS.

Proposed Action

The proposed action was designed to meet the purpose and need, forest plan management area objectives, BLM BFO RMP goals and objectives, and to be responsive to issues raised by Forest Service and BLM specialists and past collaborative group recommendations for the project area. The proposed action was presented to the public during the scoping process (see Public Involvement section in this chapter) which identified issues that drove the development of alternative ways to meet the purpose and

need. The proposed unit-by-unit treatment summary can be found in appendix A of this DEIS.

Vegetation and Prescribed Fire Treatments

Implementation of proposed treatments would include the use of ground-based mechanical equipment, cable systems, and hand and/or fire treatments in order to remove hazardous fuels from the project area (Maps – DEIS Appendix E). Approximately 43 miles (39 mile on FS lands and 4 on BLM lands) of temporary road construction, 6 miles of road maintenance, and 32 miles of road reconstruction would be needed to implement the proposed action. There would be an estimated total of 38 miles of haul route needed. All temporary roads would be obliterated after harvest activities have been completed. Post-treatment activities would include treating all units with prescribed fire (underburning, site prep burning, broadcast burning, jackpot burning, and handpiling/burning). Up to approximately 7,936 acres of prescribe fire and or vegetation treatments could occur in within the Inventoried Roadless Areas (Jericho Mountain and Lazyman Gulch IRAs).

Watershed Improvement

Watershed improvement activities are proposed with the intention to improve water quality and aquatic habitat conditions in project area streams and wetlands, including streams that deliver water to the City of Helena's municipal water supply intakes. These activities also move the forest toward meeting the restoration goals of the Lake Helena Total Maximum Daily Load (TMDL) report (EPA 2006). These activities would occur in both action alternatives and include wetland restoration, westslope cutthroat trout restoration, culvert upgrades, and road decommissioning. Chapter 2 of this DEIS presents additional detailed information on proposed watershed improvement activities.

Site-Specific Forest Plan Amendment

A site-specific Forest Plan amendment may be needed for various forest-wide standards regarding big game thermal cover on winter range, open road densities during the big game hunting season, winter range, and different recommendations from the Montana Elk Logging Study in addition an amendment to specific management area standards. The amendment would apply to the Jericho, Black Mountain-Brooklyn Bridge, and Quartz Creek elk herd units. Chapter 2 of this DEIS provides additional detailed information on the site-specific amendment to standards for wildlife

Statutory and Regulatory Framework

Several important laws, executive orders and policies form the statutory and regulatory framework applicable to managing the Helena National Forest and the Butte Field Office of the Bureau of Land Management (BLM), a partial list for both agencies follows. While most pertain to all Federal lands, some of the laws are specific to Montana. This framework is also an integral part of the purpose and need for action. In addition to the following laws and documents, each specialist report identifies the regulatory framework that is applicable to their analysis. Disclosures and findings required by these laws and orders are contained within each resource specialist report and in the project file.

The National Forest Management Act (NFMA) of 1976 governs vegetation management on national forest lands. Several sections in the act, and its accompanying regulations, specifically address terms and conditions relevant to the vegetation resource. These include sections on timber suitability and management requirements for vegetative manipulation, including tree regeneration timeframes and opening size limits.

The size of harvest openings created by even-aged silvicultural systems will normally be 40 acres or less, and the creation of larger openings requires 60-day public review and Regional Forester approval. However, where natural catastrophic events such as fire, windstorms, or insect attacks have occurred, 40 acres may be exceeded without 60-day public review and Regional Forester approval, provided the public is notified and the environmental analysis supports the decision (USDA 2002). Many proposed treatments in the Action Alternatives would exceed 40 acres due to extensive MPB-caused mortality and a desire to emulate natural disturbance patch sizes, as supported by this analysis. The public is hereby notified of these areas. (Forested Vegetation Specialist Report). In these units and contiguous groups, prescriptions would include varying amounts of tree retention in surviving components, potentially buffering openings, leaving individuals and clumps throughout units, and including patches of inoperable areas. However, because the overstory is largely dead and reforestation is required, these are considered openings.

The National Environmental Policy Act (NEPA 1969). The Forest Service has prepared this environmental impact statement (EIS) in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. This EIS discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives.

As required under the **Federal Land Assistance, Management, and Enhancement (FLAME) Act** of 2009 the Secretaries of Interior and Agriculture are required to submit a report to Congress on their efforts in producing an integrated wildfire management strategy. The Wildland Fire Leadership Council guided the development of the National Cohesive Wildland Fire Management Strategy, known as the Cohesive Strategy (USDA/DOI 2011), that provides consistent interagency direction.

In 2014, the Tri-County FireSafe Working Group came together to update and improve the 2005 Community Wildfire Protection Plan (CWPP) while still meeting its original intent and goals. This plan was finalized and signed in 2015. This Regional CWPP recommends treatment options be proposed on a landscape scale and develop a strategic plan that looks across jurisdictional boundaries. Propose and implement projects that will protect communities at risk from wildfire. Develop and propose protection measures for municipal watersheds. Focus first on the wildland urban interface communities at risk. Use state of the art fire modeling methods to determine the best places to spatially locate dispersed fuels treatments in the general forested areas outside of the wildland urban interface area. Propose to treat a minimum of approximately 20 percent of the general forested area. (Spatial Strategies for Landscape Fuel Treatments, Mark A. Finney). Activities to accomplish these objectives should include prescribed fire, mechanical or hand thinning, grazing, or combinations of these and other methods.

The Helena National Forest Plan (1986) (FP), as amended, provides detailed direction and guidance for managing public lands on the Helena National Forest. The FP embodies the provisions of NFMA, its implementing regulations, and other guiding documents. Guidance from the Record of Decision for Amendments to the Forest Plan (1986) is incorporated in the Forest Plan. Forest Service Manuals (FSM) and Forest Service Handbooks (FSH) provide direction and were applied to the development of this project. This plan also identifies Management Areas (MAs) and provides direction for each. The actions proposed in this project are designed to be consistent with the Forest Plan, including all plan amendments currently in effect, to the extent possible given the existing conditions. Where Forest Plan direction may not be met, a site-specific Forest Plan amendment would be proposed.

The Forest Plan provides two types of management direction, Forest-wide direction and management area (MA) direction. Forest-wide direction, which applies to all MAs, is located on pages II/14 through II/36 of the Forest Plan. Table 9 displays the management areas within the project area and the following table lists the acres of each MA found within the project boundary, and relevant goals by MAs as described in the Forest Plan. The project area overlaps and includes treatments within the Jericho Mountain and Lazyman Gulch Roadless Areas.

Helena National Forest Management Areas H1, H2, L1, L2, M1, R1, T1, T3, T4, T5, W1, W2 and private lands are included in the Tenmile – South Helena project area. The forest-wide management direction in Chapter II of the Forest Plan applies to all management areas (Forest Plan III/1). For additional information on the MA goals, resource potentials, and limitations, see the Helena Forest Plan on pages III/1 to III/92.

The following table is a list of MA's and a summary of the goals relevant to this proposal of the management areas within the project area.

Table 9. Management Areas and associated acres within the Tenmile–South Helena project area

Management Area (Acres)	Pages In Forest Plan	Goals Relevant To This Proposal
H1 (14,292 acres)	H-1 III/17- III/19	Provide a quantity and quality of water which will, with adequate treatment, result in a satisfactory and safe domestic water supply for the City of Helena. Provide cover and forage for big game animals and necessary habitat components for nongame animals. Provide for dispersed recreation opportunities.
H2 (4,145 acres)	H-2 III/21- III/23	Provide a quantity and quality of water which will, with adequate treatment, result in a satisfactory and safe domestic water supply for the City of Helena. Provide cover and forage for big game animals and necessary habitat components for nongame animals. Provide healthy timber stands and optimize growing potential over the planning horizon while protecting the soil and water resources. Provide for dispersed recreation opportunities.
L1 (1,532 acres)	L-1 III/11-III/13	Maintain or improve vegetative conditions and livestock forage productivity
L2 (739 acres)	L-2 III/14-III/16	Maintain or improve ranger vegetative conditions and forage production for livestock and elk.
M1 (7,486 acres)	M-1 III/5-III/7	Maintain the present condition with minimal investment for resource activities, while protecting the basic soil, water, and wildlife resources.
R1 (4,217 acres)	R-1 III/24- III/26	Provide a variety of semi-primitive and primitive nonmotorized recreation opportunities. Provide for maintenance and/or enhancement of fishery, big game, and nongame habitat, grazing allotments, visual quality, and water quality.
T1 (9,059 acres)	T-1 III/30- III/33	Provide healthy timber stands and optimize timber growing potential over the planning horizon. Emphasize cost-effective timber production, while protecting the soil productivity. Maintain water quality and stream bank stability. Provide for dispersed recreation opportunities, wildlife habitat, and livestock use, when consistent with the timber management goals.
T3 (265 acres)	T-3 III/38- III/41	Maintain and/or enhance habitat characteristics favored by elk and other big game species. Provide for healthy timber stands and timber harvest program compatible with wildlife habitat goals for this area. Emphasize cost – effective timber production, while protecting the soil productivity. Maintain water quality and stream bank stability. Provide for other resource objectives where compatible with the big game summer ranger and timber goals.
T4 (1,040 acres)	T-4 III/42- III/45	Maintain healthy stands of timber within the visual quality objective or retention and partial retention. Provide for other resource uses as long as they are compatible with visual quality objectives. Emphasize cost – effective timber production, while protecting the soil productivity. Maintain water quality and stream bank stability.
T5 (5,263 acres)	T-5 III/46- III/49	<p>Increase production and quality of forage. Manage timber sites cost-effectively, by selecting the most economical harvest system and managing for natural regeneration.</p> <p>Provide for healthy stands of timber and timber products consistent with increasing quality and quantity of forage. Emphasize cost- effective timber production, while protecting the soil productivity. Maintain water quality and stream bank stability.</p> <p>Provide for other resource uses that are compatible with the other goals.</p>
W1 (1,412 acres)	W-1 III/50- III/52	Optimize wildlife habitat potential, including old growth, over the long term. Provide for other resource uses, if they are compatible with wildlife management goals.

Management Area (Acres)	Pages In Forest Plan	Goals Relevant To This Proposal
W2 (96 acres)	W-2 III/53- III/55	Maintain and/or enhance habitat characteristics favored by elk and other big game species during spring, summer, and fall. Provide habitat diversity for non-game wildlife species. Provide forage for both big game and livestock. Provide for other resource objectives as long as their uses are compatible with the wildlife and livestock objectives.

In addition, a description of each management area and pertinent goals are provided in appendix B of this document. This appendix summarizes the Forest Plan Standards and Goals as well as the applicable management area direction. It also provides a synopsis of how the project responds to the standards and guidelines for the Forest Plan and by each management area.

Treatments using harvest may occur in several MAs. Some of these MAs are suitable for timber production, and include goals of managing for healthy stands of timber and optimizing growing potential. Other MAs are considered unsuitable for timber, but harvest may be used as a tool to meet the other objectives of the MA.

Forest Management must also consider direction in the Inland Native Fish Strategy (INFISH 1995) which provides direction to protect habitat and populations of resident native fish outside of anadromous fish habitat. Other pertinent direction including the Northern Rockies Lynx Management Direction is also considered.

The Endangered Species Act of 1973, as amended (ESA 1973, 16 U.S.C. 1531) provides direction to the Forest Service to establish objectives for habitat management and recovery through the Forest Plan for the conservation and protection of endangered and threatened species. This project is consistent with the Forest Plan for listed species and is therefore consistent with these guidelines. The U.S. Fish and Wildlife Service was consulted to determine which species required evaluating for the project. An analysis of effects on listed species was conducted and documented in a Biological Evaluation. Consultation is ongoing and will be completed prior to issuing a decision on this project.

The Migratory Bird Treaty Act, Presidential Executive Order 13186 10 January 2001. Migratory birds are included under the Migratory Bird Treaty Act (MBTA) and incorporate most species of birds present in the project area. In December 2008, the Forest Service entered into a memorandum of understanding (MOU) with the United States Department of Interior (USDI) Fish and Wildlife Service on the Migratory Bird Treaty Act to further clarify agency responsibilities (USDA Forest Service and USDI Fish and Wildlife Service 2008). Four key principles embodied in the MOU direct the Forest Service to (1) focus on bird populations; (2) focus on habitat restoration and enhancement where actions can benefit specific ecosystems and migratory birds dependent on them; (3) recognize that actions taken to benefit some migratory bird populations may adversely affect other migratory bird populations; and (4) recognize that actions that may provide long-term benefits to migratory birds may have short-term impacts on individual birds. The parties agreed that through the NEPA process, the Forest Service would evaluate the effects of agency actions on migratory birds, focusing first on species of management concern along with their priority habitats and key risk factors.

Executive Order 13186 directs departments and agencies to take certain actions to further implement the MBTA. Specifically, the Order directs Federal agencies, whose direct activities will likely result in the “take” of migratory birds, to develop and implement a memorandum of understanding with the USFWS that shall promote the conservation of bird populations. Under Executive Order 13186 the USFWS is responsible to ensure that environmental analyses of Federal actions evaluate the effects of actions and agency plans on migratory birds, with emphasis on species of concern.

In 1963 Congress passed the **Federal Clean Air Act** and amended the act in 1970, 1977, and 1990. The purpose of the act is to protect and enhance air quality while ensuring the protection of public health and welfare. The 1970 amendments established National Ambient Air Quality Standards (NAAQS), which must be met by most state and federal agencies, including the Forest Service.

States are given the primary responsibility for air quality management. Section 110 of the Clean Air Act requires states to develop State Implementation Plans (SIPs) that identify how the state will attain and maintain NAAQS. The **Montana Clean Air Act** (MCAA)(1967) promulgates the SIP and created the Montana Air Quality Bureau (now under the Montana Department of Environmental Quality-MDEQ). The Clean Air Act also allows states, and some counties, to adopt unique permitting procedures and to apply more stringent standards.

The Federal Clean Water Act, as amended, is commonly referred to as the Clean Water Act (CWA). The CWA required each state to develop its own water quality standards, subject to the approval of the Environmental Protection Agency (EPA). Section 303(d) of the CWA required each state to assess all water bodies within its borders in order to identify water quality impairments that exceeded state standards. Under the CWA, water bodies identified as impaired generally require the development of a “Total Maximum Daily Load” (TMDL—a water quality restoration plan). The state is required to systematically develop these plans in collaboration with the EPA. Some stream segments in the TSH Project area are on the Montana 303(d) list of water-quality impaired streams not fully supporting all listed beneficial uses. Listed impairments include alteration in stream-side or littoral vegetative covers, arsenic, cyanide and sedimentation/siltation. Any permits needed for implementation would be obtained before operations were initiated.

National Historic Preservation Act, Section 106 (1966 as amended) Federal agencies have independent statutory obligations under National Environmental Policy Act (NEPA) and National Historic Preservation Act (NHPA). Section 106 and the NEPA ensures that our natural, cultural and historic environment is given consideration in Federal project planning. Federal courts have characterized both laws as requiring the Federal Government to “stop, look and listen” before making decisions that might affect historic properties as a component of the human environment. The Advisory Council on Historic Preservation (ACHP) and Council on Environmental Quality (CEQ) developed a handbook called NEPA and NHPA A Handbook for Integrating NEPA and Section 106 (CEQ and ACHP 2013) to address a long standing need to improve the abilities of Federal agencies to conduct these environmental reviews in the most efficient and effective way possible. The handbook provides advice on implementing a 1999

provision in the Section 106 regulations, “Coordination with the Nation Environmental Policy Act”, 36 CFR 880.8. It also provides advice on implementing CEQ regulations requiring the integration of NEPA and other policies.

The NEPA and NHPA Handbook (2013) uses the term “integrate” to encompass the terms used in both Section 106 and the CEQ regulations. “Integrate as used in 40 CFR 1500.0(c) and 1052.25 encompasses “coordinate” as used in 36 CFR 800.8(a) and “substitution” of a NEPA process for Section 106 as used in 36 CFR 800.8(c). When the NEPA review and Section 106 are integrated, whether through coordination or substitution, an agency assesses ways to avoid, minimize, or mitigate adverse effects while identifying alternatives and preparing NEPA documents (CEQ and ACHP 2013).

The HLCNF intends to use the substitution approach for the Tenmile-South Helena project as outlined in the NEPA and NHPA Handbook (2013). Substitution under 36 CFR 800.8(c) permits agencies to use the NEPA review to comply with Section 106 as an alternative to the process set out in 36 CFR 800.3-800.6 (CEQ and ACHP 2013). The use of a substitution approach allows agencies to use the procedures and documentation required for the preparation of an EIS/ROD to comply with the Section 106 procedures (CEQ and ACHP 2013). To do so, the agency must notify the ACHP, State Historic Preservation Office (SHPO) and Tribal Historic Preservation Offices (THPO) in advance that it intends to do so and meet certain specified standards and documentation requirements as set forth in 36 CFR 800.8(c)(1). The HNF notified the ACHP and the MT SHPO in February 2015 of their intent to use this substitution approach for the Tenmile-South Helena project. The THPOs were notified of this approach in March 2015.

Roadless Area Conservation Rule. The Department of Agriculture, Forest Service adopted the Roadless Area Conservation Rule in 2001 (36 CFR 294) with the purpose “to establish prohibitions on road construction, road reconstruction, and timber harvesting in inventoried roadless areas on National Forest System lands. The intent of this final rule is to provide lasting protection for inventoried roadless areas within the National Forest System in the context of multiple-use management.” Within this rule, the Agency decided to establish a national level rule for the management of roadless areas. Decisions made in the 1986 Helena Forest Plan that allowed certain forms of timber harvesting and/or road construction and/or road reconstruction in inventoried roadless areas must follow the intent of this rule.

Within this rule, the cutting, sale, or removal of trees must be clearly shown through project level analysis to contribute to the ecological objectives described in 36 CFR 294.13(b)(1), or under the circumstances described in paragraphs (b)(2) through (b)(4). Such management activities are expected to be rare and to focus on small diameter trees. Thinning of small diameter trees, for example, that became established as the result of missed fire return intervals due to fire suppression and the condition of which greatly increases the likelihood of uncharacteristic wildfire effects would be permissible.

Within this rule the characteristics of Roadless Areas are identified. They include:

- High quality or undisturbed soil, water, and air.
- Sources of public drinking water.

- Diversity of plants and animal communities.
- Habitat for threatened, endangered, proposed, candidate, and sensitive species, and for those species dependent on large, undisturbed areas of land.
- Primitive, semi-primitive nonmotorized and semi-primitive motorized classes of dispersed recreation.
- Reference landscapes.
- Natural appearing landscapes with high scenic quality.
- Traditional cultural properties and sacred sites.
- Other locally identified unique characteristics.

The Native American Graves Protection and Repatriation Act, and the American Indian Religious Freedom Act of 1978 require Federal agencies to consult with culturally affiliated tribes and determine possible effects to sites and other culturally significant resources resulting from activities within a proposed project area.

Carlson-Foley Act of 1968 (Weed Control on Public Lands): The Carlson-Foley Act (P.L. 90-583) directs federal agencies to enter upon lands under their jurisdiction having noxious plants (weeds), and destroys noxious plants growing on such land.

Federal Noxious Weed Act of 1974, as amended in 1988, 1994: The Federal Noxious Weed Act of 1974 (P.L. 93-629) (7 U.S.C. 2801 et seq.), as amended by the Food, Agriculture, Conservation and Trade Act of 1990, Section 1453 (Section 15 - “Management of Undesirable Plants on Federal Lands”), directs federal agencies to have an office or person trained to coordinate an undesirable plant management program, adequately fund the program, implement cooperative agreements, and conduct IPM Techniques.

Butte Field Office of the BLM Resource Management Plan (2009). As part of the Tenmile – South Helena project, a variety of vegetation and prescribed burning treatments are proposed on approximately 1,043 acres of BLM lands administered by the Butte Field Office (BFO). The Resource Management Plan (RMP) provides a single, comprehensive land use plan to guide management of public lands as administered by the BFO. The plan provides goals, objectives, allowable uses, and management direction to maintain, improve, or restore resource conditions and to provide for long-term economic needs of local communities. The BFO RMP goals and objectives only apply to proposed activities located on BLM lands. The actions proposed in this project are designed to be consistent with the BFO RMP. BFO RMP goals pertaining to the Tenmile – South Helena Project include: FM1, FM2, FW1, FW2, FW3, and FW4.

FM1- Provide an appropriate management response to all wildland fire, emphasizing firefighter and public safety.

FM2- Move towards restoring and maintaining desired ecological conditions consistent with appropriate fire regimes.

FW1- Restore and/or maintain the health and productivity of public forests, to provide a balance of forest and woodland resource benefits, as well as wildlife and watershed needs to present and future generations.

FW2- Manage forestry resources to provide a sustained flow of local social and economic benefits and protect non-market economic values.

FW3- Maintain and/or improve sustainability and diversity of woodland communities to meet ecological site potential.

FW4- Manage dry forest types to contain healthy, relatively open stands with reproducing site-appropriate, desired vegetation species.

Vegetation Treatments Using Herbicides on BLM Lands in 17 Western States Programmatic EIS approved on September 29, 2007 and the Butte Field Office Weed Management Plan Revision (MT-B070-2009-00011-EA), approved May 2009 provide guidance for weed treatment with the use of herbicides on federal BLM lands.

Title 43, USDI-BLM Code of Federal Regulations, Part 5003 (2015): Title 43 is the principle set of rules and regulations issued by federal agencies of the United States regarding public lands under the jurisdiction of the Department of the Interior. Part 5003 provides direction on administrative procedures for activities proposed on Bureau of Land Management lands. This regulation only applies to proposed activities located on BLM lands.

The **Federal Land Policy and Management Act (FLPMA) was enacted in 1976** for the purposes of establishing a unified, comprehensive, and systematic approach to managing and preserving public lands in a way that protects "the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archeological values." The FLPMA is administered by the Bureau of Land Management (BLM). Under the FLPMA, the BLM is required to establish a planning process for the management of public lands that accommodates multiple uses of the land and its resources and achieves sustained yields of natural resources.

Other Considerations

The Northern Region Overview (1998) sets priorities for ecosystem restoration and focuses the Forest Service Natural Resource Agenda for the National Forest lands of the Northern Region. For forest vegetation, the overview establishes indicators of risk to the proper functioning conditions of this ecosystem. Risk indicators include: (1) the loss of species composition at the cover type level, (2) the change in landscape level fragmentation, and (3) stand level structure as measured by density and seral stage/size class distribution. The overview also describes the importance of restoring ponderosa pine, western larch, and whitebark pine (USDA, 1998). The overview identifies aspen, whitebark pine, ponderosa pine, sagebrush, and grasslands among the areas of concern currently at risk in the Northern Region. The agents of change listed for these areas of concern include mountain pine beetle (MPB), fire (including suppression), blister rust, root disease, noxious weeds/exotic species, grazing, and timber harvest.

Forest Service Manual (FSM) and Forest Service Handbook (FSH): The Forest Service Manuals and Handbooks provide management direction and guidance for Forest Service analysis and activities. See the individual specialist reports for the applicable sections.

Northern Region Integrated Restoration and Protection Strategy. The Northern Region Integrated Restoration and Protection Strategy provides information to help local Forest Service units identify and prioritize potential areas for accomplishing Forest and Grassland Plan goals and objectives, and thus meeting this mission. This strategy focuses on restoration and maintenance of watersheds, wildlife habitats (including more resilient vegetation conditions), and the protection of people, structures, and community infrastructure in and associated with the wildland-urban interface. Values in these focus areas may be threatened by large scale fires, drought, insects and disease, invasive plants and animals, forest encroachment into grasslands, dense vegetation that create hazardous fuel conditions, erosion, sedimentation, and toxic chemicals.

R1 Guidance for Roadless Area Analyses. Region 1 provides additional guidance for roadless area analysis in a draft document titled “Our Approach to Roadless Area Analysis and Analysis of Unroaded Lands Contiguous to Roadless Areas” (12/2/10). In summary this paper is based on court history regarding the Roadless Area Conservation Rule. The “Our Approach” document states that “projects on lands contiguous to roadless areas must analyze the environmental consequences, including irreversible and irretrievable commitment of resources on roadless area attributes, and the effects for potential designation as wilderness under the Wilderness Act of 1964. This analysis must consider the effects to the entire roadless expanse – that is both the roadless area and the unroaded lands contiguous to the roadless area.”

Species Designation for Whitebark Pine R1 Regional Forester Letter (2011) This letter specifies that whitebark pine is designated as a sensitive species in Region 1 because of the U.S. Fish and Wildlife Service finding that the listing of whitebark pine under the Endangered Species Act (ESA) was warranted but precluded, making it a candidate species for listing. The letter notes that the designation should not change our approach to restoration of whitebark pine, and in fact hopefully accelerate actions to restore whitebark pine (USDA 2011b).

Public Involvement

Many organizations and individuals have an interest in activities within the Tenmile - South project area. This interest is motivated by several factors, including the valued resources the area provides, proximity of the activities to the towns of Helena, Rimini, Clancy, Montana City, Unionville and private inholdings throughout the project area, and the high quality water supply for the City of Helena.

The public as well as various agencies and organizations have raised concerns over the hazardous fuel conditions within the WUI in the project area and the Upper Tenmile Creek watershed, and numerous mitigations have already been implemented in a collaborative manner. These groups have invested considerable effort in the exchange of ideas of how to maintain or improve the character of the Tenmile – South Helena project area.

The Tenmile Watershed Collaborative Committee (TMWCC) was appointed by the Helena City Commission in 2008 to develop recommendations to address interrelated issues in the watershed. In 2009, the TMWCC provided suggested goals and recommendations for management needs in the watershed. Part of the recommendations

included the use of prescribed fire, including pre-fire fuels thinning where appropriate at a landscape scale. They concluded that this approach represents the best strategy to minimize the risk of an uncontrollable wildfire in the Tenmile watershed. The TMWCC conducted their final meeting and completed their final report in June of 2009.

In addition, the Regional Tri-County

Community Wildfire Protection Plan (CWPP) has been developed to act as a compilation of data that has been generated by many members of the Tri –County FireSafe Working Group (TCFWG). TCFWG includes individual citizens, local government, state and federal agencies, interested contractors, and fire suppression departments from Lewis & Clark, Jefferson, and Broadwater counties.

Based in part on the collaborative groups' recommendations, the HLCNF identified a preliminary project area that encompasses the Tenmile Watershed, South Hills, and Colorado Mountain areas. This was presented at a public open house meeting on July 9, 2014 at the Baxendale Fire Station in which about 30 members of the public attended. This meeting was attended by the general public; local, state, and other federal agencies; in addition to various non-profit groups, cooperators, and agency partners.

A recently-formed collaborative group made of diverse stakeholders called the Tenmile - South Helena Forest Restoration Collaborative Committee (TSHFRCC) appointed by the City of Helena was also engaged in project development and will continue to provide recommendations on project planning and design. The City has appointed the collaborative to consider and recommend to managing agencies, including the Helena – Lewis & Clark National Forest, management opportunities in the Tenmile Watershed and the City of Helena's wildland urban interface (WUI) for mitigation of fire risk and to reduce the potential for damage to the City's public water supply infrastructure as well as review projects in relation to appropriate vegetation management, fire mitigation, watershed, and other resource and recreation management (Resolutions of the City of Helena, Montana – Resolution No. 20106, 2014)". For further information on City of Helena's past and current collaborative efforts go to:

<http://www.helenamt.gov/tmcwp.html>

Collaboration has also occurred with the US Forest Service Rocky Mountain Research Station and Missoula Fire Sciences Laboratory in which data was collected and used for the project area and to calibrate a model that predicted potential fire behavior across the fireshed (a roughly 30 square kilometer (18.6 square mile) zone around the project area)—an area in which an ignition would have the potential to impact the project area.

A preliminary proposed action was presented to project partners, members of the TSHFRCC, and the general public at a meeting held on October 2, 2014 at the Helena



Figure 5. Members of the public engaged in the October 2, 2015 Preliminary Proposed Action open house public meeting.

National Forest Supervisor's office. 23 members of the public attended this meeting and provided feedback prior to formal release of the project's proposed activities. The information was used by the Forest Service to further refine proposed treatment units which led to the development of the project's proposed action that was presented to the public during a 30-day scoping comment period which was extended upon request from the public. The scoping comment period ended on December 12, 2014.

During the scoping comment period, the Helena Ranger District held two public meetings on November 4, 2014 at the Unionville Fire Station where about 20 members of the public attended. The second meeting was held on November 5, 2014 at the Baxendale Fire Station in which about 30 members of the public attended. Information describing the proposed action included descriptions of proposed activities, maps, photos.

The scoping period also entailed preparing and printing a Notice of Intent (NOI) to prepare an Environmental Impact Statement in the Federal Register (published on October 29, 2014). Additionally, cover letters and project proposal information was mailed to about 900 members of the public notifying them of the opportunity to comment on the proposed action. Approximately 120 comments were received from the public and other agencies which were used to identify issues and develop alternative proposals to the proposed action.

Issues

Issues serve to highlight effects or unintended consequences that may occur from the proposed action or alternatives. The Tenmile – South Helena IDT separated the issues identified during scoping into two groups: significant and non-significant issues. Significant issues were defined as those directly or indirectly caused by implementing the proposed action or alternatives, involve potentially significant effects, and could be meaningfully and reasonably evaluated and addressed within the scope of this proposal⁴. Alternatives were developed around those significant issues that involved unresolved conflicts concerning alternative uses of available resources.

The IDT for the Tenmile – South Helena project identified the following significant issues during scoping:

Inventoried Roadless Areas

Several commenters expressed concern about proposed activities within the Jericho Mountain and Lazyman Gulch Inventoried Roadless Areas (IRAs). Specifically, concerns were about the use of mechanized equipment to implement proposed vegetation and prescribe burning activities in IRAs; commercially harvesting timber within IRAs; proposed treatment in and around Black Hall Meadows located in the Lazyman Gulch

⁴ Some issues have already been considered and evaluated through broader programmatic NEPA (e.g. the 1986 Helena National Forest Plan FEIS, 2006 Helena National Forest Weed Treatment Project FEIS, 2007 Northern Rockies Lynx Management Decision FEIS, 2009 BLM Butte Field Office Weed Management Plan Revision). In these cases, the issues focus on evaluating the effects unique to and commensurate with the decisions being considered here (40 CFR 1401.7(a)(3)).

IRA; as well as the proposal of any treatments located in IRAs. In some cases, commenters requested that a new alternative be developed that would incorporate these issues while others requested analysis be done that displays how proposed activities may potentially effect the IRAs' consideration for future wilderness designation. Alternative 3 features no mechanized treatment or commercial harvest within IRAs; the exception to this is mechanized treatments would be allowed within private land buffer units. Also featured is an overall reduction in treatments within IRAs.

Additionally, modifications were made to the initial proposed action that took into account scoping issues such as removing proposed treatments in and around Black Hall Meadows. Further, an analysis has been conducted that displays the potential effects of proposed activities on Inventoried Roadless and Roadless Area resources (see chapter 3 of this DEIS).

Measures to Evaluate:

- Acres of mechanical treatment in IRA
- Acres of commercial harvest in IRA
- Acres of treatment in IRA

Elk Security and Hiding Cover

Several commenters also had concern about possible treatments effects on elk security and hiding cover. In summary, commenters requested that hiding cover be maintained in areas adjacent to previously treated lands in past projects as well as to limit the effects on existing hiding cover throughout the project area. Alternative 3 features a reduction in the amount of hiding cover treated within security and intermittent refuge areas. This includes areas adjacent to past treated areas as well as within elk herd units as a whole.

Measures to Evaluate:

- Treatment acres occurring within mapped security areas.

Recreational Trails

Several commenters were concerned about the use of mechanical equipment to access treatment units and/or implement proposed vegetation treatments immediately adjacent to popular recreational trails within the project area. Specifically, commenters requested that non-motorized trails throughout the project area (39 miles), in particular trail #348, the Continental Divide National Scenic Trail (CDNST), and trails located within the Helena South Hills, not be used to facilitate mechanical entry into proposed vegetation units. Also requested was to not convert non-motorized trails into roads for the purpose of implementing proposed vegetation treatments and to not conduct treatments along the CDNST. Alternative 2 is the only action alternative that proposes the use of mechanical equipment on non-motorized trails (South Hills, Switchback, and CDNST trails). Impacts are anticipated to be short-term and would not occur on the entire length of the trails. Instead, mechanical equipment would utilize the trail only in select locations while other portions of the trail could be treated via hand methods or could receive no treatment at all. Alternative 3 limits mechanical equipment on existing non-motorized trails by

proposing to only utilize hand treated methods in the Helena South Hills, IRAs, and along the CDNST. However, alternative 3 still proposes vegetation treatments along the CDNST but would be conducted with non-mechanized methods. The absence of treatment along the CDNST is considered and analyzed under alternative 1.

Measures to Evaluate:

- Miles of trail within treatment units.

Road Construction

Several commenters were concerned about new road construction, along with re-construction of existing roads. Concerns with road building included weed introduction/spread, illegal motorized use, habitat security, and erosion/sedimentation. Alternative 3 was designed to address wildlife concerns and minimize new temporary road construction, while still being able to meet overall project objectives.

Measures to Evaluate:

- Miles of temporary road construction followed by full obliteration, miles of road maintenance, miles of road reconstruction, and miles of haul routes

Decision Framework

The Responsible Official for proposed activities on lands administered by the NFS is the Forest Supervisor of the Helena – Lewis & Clark National Forest. The Responsible Official for proposed activities on lands administered by the BLM is the Field Manager of the BLM – Butte Field Office. Each Responsible Official will make their own decisions for their respected agencies and document them in separate Record of Decisions (ROD) following the completion of the final environmental impact statement (FEIS). Decisions to be made are as follow:

Decisions to be made on NFS Lands:

- Whether to implement the proposed action or an alternative to the proposed action for those portions located on NFS lands;
- What monitoring requirements are appropriate to evaluate implementation of this project for those portions located on NFS land, and;
- Whether a forest plan amendment is necessary.

Decisions to be made on BLM lands:

- Whether to implement the proposed action or an alternative to the proposed action for those portions located on BLM lands and;
- What monitoring requirements are appropriate to evaluate implementation of this project for those portions located on BLM lands.

CHAPTER 2. ALTERNATIVES, INCLUDING THE PROPOSED ACTION

Introduction

This chapter describes and compares the alternatives considered by the Forest Service and Bureau of Land management Responsible Officials for the Tenmile – South Helena Project. It includes a discussion of how the alternatives and design features common to all alternatives were developed through the incorporation of resource and the public participation process. Numbers such as acres and miles are approximate, given the limitations of GIS data. Also included are descriptions and comparisons of the alternatives considered in detail, focusing on key issues and measurement indicators.

Chapter 2 presents the alternatives in comparative form - providing a clear basis for choice among options by the decision makers and the public. The information used to compare alternatives is summarized from chapter 3, "Affected Environment and Environmental Consequences". Chapter 3 contains the detailed scientific basis to measure the potential environmental consequences of each of the alternatives. For a more detailed description of the potential effects of the alternatives, please see chapter 3.

Alternatives

Section 102(2)(3) of the NEPA states that all Federal agencies shall “study, develop, and describe appropriated alternatives to recommend courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources.”

Resource specialist for the project were requested to take a hard look at reasonable alternatives in order to provide full and fair discussion of significant environmental impacts so as to inform decision makers and the public of the reasonable alternatives which would avoid or minimize adverse impacts or enhance the quality of the human environment (40 C.F.R. § 1502.1).

The range of alternatives may extend beyond the limits set by Forest Plan goals and objectives under the NEPA; however, the NFMA requires that the selected alternative fully comply with the Forest Plan, unless the plan is amended in accordance with 36 CFR 219.10(F).

The range of alternatives developed and presented in this chapter was based on evaluation of public, partner, and internal comments during scoping of the purpose and need for the project. This project is intended to meet the purpose and need while maintaining resource conditions which are consistent with the HNF Forest Plan and the Bureau of Land Management (BLM) Butte Field Office (BFO) Resource Management Plan (RMP). Other influences included Forest Plan goals, objectives, standards and guidelines; BLM RMP objectives; and federal laws, regulations and policies. Within these parameters, the alternatives display a range of outputs, treatments, management requirements, design elements, and effects on resources.

Several alternative approaches to the proposed action are considered to meet the purposes and needs for action in the project area. Three alternatives are considered in detail, and are discussed throughout this document. The other alternatives were considered but not given detailed study and are discussed briefly below.

40 CFR 1502.14 (e) states that agencies shall identify an alternative or alternatives, if one or more exists, in the draft statement and identify such alternative in the final statement unless another law prohibits the expression of such a preference. A preferred alternative has not been identified by the Forest Service or BLM at this time. The final statement will display the identified preferred alternative.

Alternatives Considered in Detail

The following section describes the No Action alternative and two action alternatives considered in detail. All alternatives would comply with all valid statutes on National Forest Service (NFS) and BLM lands. Impacts to resources are considered through the National Environmental Policy Act (NEPA) of 1969.

For an alternative to be analyzed and considered in detail, it must respond to the purpose and need for action and significant issues as described in Chapter 1. This document has three alternatives that were analyzed in detail.

Maps of the action alternatives are located in appendix E of this DEIS.

Alternatives at a Glance

The following tables provide an overview of treatments, methods, road activities, burning activities and watershed improvement activities proposed across the project area on both Forest Service and Bureau of Land Management lands.

Table 10. Proposed treatments on Forest Service and BLM lands combined and associated acres by alternative.

Treatment Type (FS and BLM Combined)		Prescription	Alt. 1 Acres	Alt. 2 Acres	Alt. 3 Acres
Commercial Removal of Fuels	Improvement Harvest	Improvement Cut followed by jackpot burn or underburn	0	2,483	1,382
	Regeneration Harvest	Clearcut with Leave Trees and site prep burn	0	3,573	2,348
		Seed Tree with Leave Trees and site prep burn	0	298	0
		Shelterwood with Leave Trees and site prep burn	0	363	102
Non-Commercial Removal or Rearrangement of Fuels	Prescribed Fire	Shaded Fuel Break (handpile burn, jackpot burn or underburn)	0	1,415	1,282
		Low Severity Grassland Prescribed Fire (jackpot or handpile burn)	0	0	1,662
		Low Severity Prescribed Fire (jackpot burn or underburn)	0	11,900	7,952
		Mixed Severity Prescribed Fire (broadcast Burn)	0	1,714	656
	Private Land Buffers	Mechanical/Hand Pile Burn or jackpot Burn	0	2,091	2,283

Treatment Type (FS and BLM Combined)		Prescription	Alt. 1 Acres	Alt. 2 Acres	Alt. 3 Acres
	Precommercial Thin	Precommercial Thin with handpile burn or Jackpot burn	0	471	445
	Total		0	24,308	18,112

Table 11. Proposed road activities and associated acres by alternative.

Road Activity	Alt. 1 Miles	Alt. 2 Miles	Alt. 3 Miles
FS New Temporary Road Construction/Decommissioning	0	39	21
BLM New Temporary Road Construction	0	4	3
Road Decommissioning	0	15	15
Road Reconstruction	0	32	28
Road Maintenance	0	6	4

Table 12. Proposed watershed improvement activities by alternative.

6th-HUC drainage	# of existing undersized or damaged culvert	# of culvert replaced to pass at least the 25-year flood event	Alt. 1	Alt. 2	Alt. 3
Lump Gulch	7	7	No	Yes	Yes
Last Chance Gulch	1	1	No	Yes	Yes
Upper Tenmile Creek	9	9	No	Yes	Yes

Table 13. Proposed watershed improvement activities by alternative.

Activity	Existing Condition	Summary of Work	Alt. 1	Alt. 2	Alt. 3
Restoration of wetland along Forest Service System Road 299	The wetland at T9N R5W Section 34 above (north of) the road along Beaver Creek would be restored and road 299 in that vicinity improved to allow surface and groundwater to pass without impacting the road surface.	Filling a drain ditch to restore the wetland water elevation to natural levels, installing appropriate drainage under the roadway, and raising the road surface elevation to improve the running surface and reduce maintenance requirements.	No	Yes	Yes
Reroute of Forest Service System Road 299 (approximately 2000 foot section)	This segment of road 299 traverses a wetland, and is frequently wet, rutted, and in generally poor condition. The road also contributes to the existing condition of the adjacent watershed discussed above.	Relocating this segment roughly 300 feet upslope in order to restore the wetland currently crossed by the road, improve road conditions, and reduce maintenance needs. This work would also compliment the wetland restoration work discussed above.	No	Yes	Yes

Activity	Existing Condition	Summary of Work	Alt. 1	Alt. 2	Alt. 3
Westslope Cutthroat Trout restoration	Non-native trout in Moose Creek and lower Minnehaha Creek.	Work would entail removing non-native species above existing barrier structures in Moose Creek and lower Minnehaha Creek by mechanical methods such as electrofishing, and reintroduce native westslope cutthroat trout.	No	Yes	Yes

Alternative 1, No Action

Alternative 1 is the no action alternative and describes the existing condition. Under this alternative, no treatments would occur. The no action alternative provides the resource specialist a means for evaluating the current ecosystem conditions as a baseline.

The Council on Environmental Quality regulations (40 CFR 1502.14d) requires that a “no action” alternative be analyzed in every EIS. This does not mean that nothing would occur under this alternative. Under the no-action alternative current management plans would continue to guide management of the project area. Ongoing work or work previously planned and approved, such as, but not limited to, routine road maintenance, weed spraying, trail maintenance, and firewood gathering would still occur. None of the actions proposed in any of the other alternatives would occur.

Alternative 2, Proposed Action

The proposed action is designed to meet the purpose and need of maintaining consistent quantity and quality of water within the municipal watershed and improving conditions for public and firefighter safety across the landscape in the event of a wildfire. These are the conditions that would allow for safer, more aggressive, and likely more successful suppression response in the event of a wildfire (see alternative 2 map in appendix E of this DEIS).

Additionally, watershed improvement and road activities are proposed under this alternative. These activities would help improve water quality and aquatic habitat conditions in project area streams, including streams that deliver water to the City of Helena’s municipal water supply intakes by addressing anthropogenic sources of sediment.

This alternative was designed with input from the public, collaborative groups, multiple agencies as well as resource specialists on the project’s interdisciplinary team. Further refinement of alternative 2 occurred between scoping and this DEIS as a result of comments received on the project during scoping and additional internal review. Some units were modified, dropped from further consideration, or relocated. These changes were made in response to public concerns, access constraints, and further field verification.

The following features are included in alternative 2:

- To facilitate the removal of fuels from the units, approximately 43 miles (39 miles on FS-managed land and 4 miles on BLM-managed land) of temporary road construction and approximately 627 ground based landings are proposed. All temporary road and landing construction would be decommissioned when harvest activities have been completed.
- To meet Best Management Practices (BMP) standards, approximately 38 miles of existing roads would be improved and/or maintained during the life of the project.
- Approximately 6,717 acres of fuel would be commercially removed from the project area as a result of regeneration and/or improvement harvest.
- Approximately 3,977 acres of fuel would be rearranged and burned by various treatment types within the project area such as pre-commercial thinning, shaded fuel breaks, and private land buffers.
- Approximately 13,614 acres of low and mixed-severity prescribed fire is proposed within the project area.
- To improve watershed conditions, water quality, and aquatic habitat conditions in the project area, 17 culverts would be upgraded to accommodate at least a 25-year flood event, a wetland would be restored along Forest Service System Road 299, a segment of Forest Service System Road 299 would be rerouted out of a wetland, and restoration of native westslope cutthroat trout would occur in two tributaries to Tennile Creek.
- In addition to the above watershed improvements, approximately 15 miles of road would be decommissioned.
- Treatment within IRAs (Jericho Mountain and Lazyman Gulch IRAs combined) would total approximately 7,936 acres.

Alternative 3

Alternative 3 is designed to address the following significant issues presented in both internal and external scoping comments: treatments within Inventoried Roadless Areas, elk security and hiding cover, recreational trails, and temporary road construction (see chapter 1 for description of issues). Treatments were modified to address the above issues while still meeting the purpose and need for the project. Modifications were made within elk security areas, especially where some islands of healthy, mature trees still exist, and total treatment acres within IRAs were reduced. Mechanical treatment, including commercial harvest, would not occur within IRAs, with the exception of private land buffers within IRAs.

Watershed improvement and road activities proposed in alternative 2 are also proposed under this alternative. These activities would help improve water quality and aquatic habitat conditions in project area streams. When coupled with the reduction of treatment within elk security areas, more big game security objectives for this alternative would be met (see alternative 3 map in appendix E of this DEIS).

The following detailed features are included in alternative 3:

- To facilitate the removal of fuels, approximately 24 miles (21 miles on FS-managed lands and 3 miles on BLM-managed land) of temporary road

construction and approximately 368 ground based landings are proposed. All temporary road and landing construction would be decommissioned when harvest activities have been completed.

- To meet Best Management Practices (BMP) standards, approximately 32 miles of road would be improved and/or maintained during the life of the project.
- Fuels on approximately 3,832 acres of land would be removed commercially from the project area through regeneration and/or improvement harvest methods.
- Fuels on approximately 4,010 acres of land would be rearranged and burned by various methods within the project area, including precommercial thinning, shaded fuel breaks, and private land buffer treatments.
- Approximately 10,270 acres of low and mixed severity prescribed fire is proposed within the project area.
- To improve watershed conditions, water quality, and aquatic habitat conditions in the project area, 17 culverts would be upgraded to accommodate at least a 25-year flood event, a wetland would be restored along Forest Service System Road 299, a segment of Forest Service System Road 299 would be rerouted out of a wetland, and restoration of native westslope cutthroat trout would occur in two tributaries to Tennile Creek.
- In addition to the above watershed improvements, approximately 15 miles of road would be decommissioned.
- No commercial harvest would occur within IRAs (Jericho Mountain and Lazyman Gulch IRAs combined) under this alternative. Mechanical treatment in IRAs would only occur within Private Land Buffers. Treatment within IRAs would total approximately 4,902 acres.

Terminology

To help the reader better understand the treatment descriptions included within the action alternatives, we have provided this section on commonly-used terminology. More definitions can be found in the glossary of the DEIS.

Silviculture

Improvement Harvest: Harvest designed to enhance growth, quality, vigor, and composition of a stand after establishment by thinning from below and removing overstory trees (i.e., “crown thinning”). Density, structure, and/or composition of the stand are altered. The stand maintains a forested appearance as substantial amounts of green, healthy large diameter trees would be retained in these dry or mixed forests within the project area. The potential for a crown fire is also reduced. A final harvest may or may not be conducted in the future depending on management goals.



Figure 6. Example of improvement harvest

Precommercial Thinning: Young plantations established from past harvest that are typically composed of small diameter trees and contain roughly 400 to 1,700 trees per acres. Treatment would be pre-commercial thinning in young stands established after past harvest leaving about 100 - 200 trees per acre of the best-formed trees. Species such as ponderosa pine, whitebark pine, and aspen would be favored where they occur. This would enhance growth and vigor and reduce the long-term risk of mountain pine beetle caused mortality. The limbs and tops of the fallen trees may be lopped and scattered to speed decomposition. Hand or machine piling and burning of piles would be completed where the fuel loading is an unacceptable risk.



Figure 7. Example of precommercial thinning

Private Land Buffer: This treatment type is designed for citizens who have completed fuels reduction or defensible space treatment on their property. This treatment type is designed to extend treatments onto public lands where it meets land management objectives and is consistent with the analysis of this DEIS. Treatment includes hand and mechanical activities to rearrange and remove hazardous fuels and reduce crown fire potential by thinning trees. Treatment in the South Helena area could extend up to 100 yards from private boundaries onto NFS lands and up to 200 yards from private boundaries onto NFS and BLM lands in the Tennile area. These treatment units would be developed cooperatively between the landowner and the FS and would incorporate site-specific considerations such as slope, topography and vegetation. The FS would remain involved and oversee implementation.



Figure 8. Example of private land buffer

Regeneration Harvest: Harvesting to create a new age class, resulting in uneven-aged, 2-aged, or even-aged stands. These harvests could include clearcutting, seedtree/shelterwood cutting, and single or group tree selection depending on the tree species and desired regeneration. For 1- or 2-aged systems, most of the overstory is removed and the stand is dominated by new regeneration. For 3-aged systems, only single trees or small groups are removed, with regeneration established in gaps.

Clearcut with Reserve Trees: Dead and dying lodgepole pine would be cut and removed. Most overstory trees would be removed. Leave trees may be retained for snags or structure; leave trees are defined site specifically with prescriptions. All other live conifers would be retained when they occur; primarily Douglas-fir with spruce and subalpine fir. These units would naturally regenerate with lodgepole pine resulting in even-aged stands.



Figure 9. Example of clearcut with reserve trees

Seedtree with Reserve Tree: Dead and dying lodgepole pine trees would be removed. Well-distributed healthy Douglas-fir and ponderosa pine would be retained at a rate of about 10-20 trees per acre to provide seed for regeneration. Natural regeneration would be promoted, though ponderosa may be planted. A mix of lodgepole pine, Douglas-fir, ponderosa pine, and/or whitebark pine regeneration is expected that contributes to landscape diversity in species composition and density. The seed trees would be left as reserves.



Figure 10. Example of seedtree with reserve tree

Shelterwood with Reserve Tree: A mix of dead and dying lodgepole and other tree species would be cut except those needed to provide seed and shelter for regeneration. A group shelterwood would be left in a clumpy distribution. Most live trees would be retained at about 20-50 trees per acre in a clumpy distribution made up of mostly healthy Douglas-fir to provide seed and shelter for seedlings. Natural regeneration would be promoted, though planting may occur for species diversity.



Figure 11. Example of shelterwood with reserve tree.

Prescribed Burning is where fire is used as a treatment tool to accomplish a variety of goals, primarily fuels reduction and vegetation restoration. This category includes the rearrangement of fuels which includes the use of mechanized equipment for the removal of hazard trees, heavy concentrations of slash / jackstraw trees, and



Figure 12. Example of slashing

slashing understory vegetation prior to prescribed burning. No ignition buffers would be required adjacent to stream courses. Hand firelines (control lines) would be constructed as needed.

The following burning activities are proposed throughout the Tennile – South Helena project area.

Slashing: Cutting generally smaller diameter trees mechanically or with chainsaws. Slashing is used to reduce ladder fuels to lower crown fire potential; to create a sufficient surface fuels to carry a prescribed fire; and/or to add fuels to meet woody debris goals for nutrient cycling. Prescriptions may call for the retention of certain species (such as ponderosa or limber pine), or a desired spacing in order to meet target stand conditions.

Pile/Burn: Hand or mechanical piling of fuels, generally follows slashing or harvest where slash disposal is needed but broadcast burning is not feasible or desirable. Slash would generally be burned when conditions are favorable, after curing. Target amounts of slash may be left to meet woody debris and nutrient cycling goals.



Figure 13. Example of pile/burn

Jackpot Burn: Jackpot burning would be conducted to consume concentrations of natural fuels and/or treatment-generated slash. Pre-positioning of fuels mechanically or by hand may be done to facilitate this activity. This activity may involve burning loose piles or areas of slash where fuels are not continuous. This would cause generally less than 10 percent mortality in the residual overstory, and burn patches would cover 30 to 50 percent of the ground surface.



Figure 14. Example of jackpot burn

Site Preparation burn: Burning following harvest where the bulk of the canopy was removed. The goal is to reduce logging slash and prepare the site for regeneration. It is a low to moderate intensity fire where direct and indirect mortality of leave trees is less than 5 percent (reserve, shelter, or seed trees left are minimal and a high priority to protect). The goals are to reduce fine woody debris (less than 3 inch diameter), reduce duff fuel loadings, expose 5 to 25 percent mineral soil, & retain most coarse woody debris (greater than 3 inch diameter) for nutrient cycling, seedling microsites, and wildlife



Figure 155. Example of site preparation burn

habitat. Additional objectives include generating heat to open serotinous cones and reduce competing vegetation. Units targeting whitebark pine regeneration will have mixed severity effects; units targeting other species will have low severity effects.

Shaded Fuel Break: Shaded fuel breaks are hand or mechanical cutting of trees to increase canopy spacing to alter the fuel profile. Slash created would be handpiled and burned or jackpot burned where feasible to reduce surface fuel loadings. Shaded fuel breaks would vary in width depending on topography, aspect, slope, stand composition, and expected fire behavior adjacent to the fuel break.



Figure 16. Example of shaded fuel break

Broadcast Burning: This is a larger-scale ‘Landscape Ecosystem Burn’ with goals of reducing hazardous fuels and restoring appropriate fire regimes to the landscape. These may include areas of:

Mixed Severity: This larger scale “Landscape Ecosystem Burn” is a mosaic of prescribed fire types and intensities resulting in a strategic landscape mosaic of fire effects – about 40 to 60 percent of each unit would be burned. Fire is used as a tool to achieve stand objectives with mixed severity. The purpose is to reduce ladder fuels and overstory tree density – heterogeneity in structure is desired. Overall mature tree mortality is generally 30 to 50 percent, occurring in patches. Other objectives include reduction of fine woody debris (less than 3 inch diameter) and duff fuel loadings. Limited amounts of mineral soil would be exposed (5 to 25 percent). Up to 30 percent of coarse woody debris (greater than 3 inch diameter) may be consumed but the remainder would be retained for nutrient cycling and wildlife habitat.



Figure 17. Example of mixed-severity burn

Low-Severity prescribed burning: Low-intensity prescribed burning will be used to improve dry forests and grass-shrub areas. In forest areas, savannah conditions would be created with understory ladder fuels and crown fire potential reduced by the treatments. In non-forest areas, encroaching conifers would be reduced. Mechanical and hand rearrangement of fuels will occur, with trees strategically slashed or thinned to facilitate prescribed burning. Direct mortality less than 5 percent, indirect mortality less than 10 percent, and less than one



Figure 18. Example of low severity prescribed burning

acre mortality patches may occur in the overstory. Objectives include reducing fine woody debris (less than 3 inch diameter), reducing duff fuel loading while minimizing exposure of soil (less than 10 percent), and retaining most coarse woody debris (greater than 3 inch diameter) for nutrient cycling and wildlife habitat.

Low-severity grassland prescribed burning:

Low-intensity grassland prescribed burning will be used to improve grassland and grass-shrub areas. In these areas, encroaching conifers would be reduced. Mechanical and hand rearrangement of fuels will occur, with trees strategically slashed or thinned, slash created from these treatments would be handpiled and burned or jackpot burned.



Figure 19. Example of low-severity grassland prescribed burning

Roads

Road Maintenance: The intention of road maintenance is to keep the road in a condition that meets BMP standards, minimizes impacts to water resources, and allows for safe timber haul. Road maintenance activities would include surface blading, vegetation removal, minor slump repair, and drainage structure cleaning and/or installation.

Road Reconstruction: The intention of road reconstruction is to improve road conditions to meet BMP standards, minimize impacts to water resources, and allow for safe timber haul. In addition to basic maintenance activities (listed above), reconstruction would also involve more significant roadway improvements, such as realignment, curve widening, or subgrade boulder or cobble excavation and removal.

Temporary Road Construction: Temporary roads for the Tenmile – South Helena Project would be improved or constructed to the minimum standard needed to provide access for harvesting equipment and log trucks while minimizing impact to water resources. These roads would be decommissioned after harvest activities are completed.

Haul Road: Road used during project implementation to haul wood products.

Road Decommissioning: For the Tenmile – South Helena Project decommissioning refers to full obliteration of the road: recontouring (returning the road prism to natural contour), removing culverts, replacing topsoil, placing woody debris upon the disturbed area to provide stability, and seeding the disturbed area.

Activities Common to All Action Alternatives

This section describes activities that would occur under both of the action alternatives – alternatives 2 and 3. It includes design features, possible Forest Plan amendment to standards, a description of how the project would be implemented, and monitoring.

Design Features Common to All Action Alternatives

Design features were developed to avoid or reduce potential adverse environmental impacts from proposed project activities, as well as to respond to concerns expressed during the scoping process. Design features and mitigation measures are an integral part of each action alternative. Appropriate design features will be selected by each land management agency (BLM and FS) and considered a requirement of the decisions should an action alternative be selected.

Vegetation

Snags: Snags, especially large diameter snags of intolerant species such as ponderosa pine or Douglas-fir, are important habitat components. All treatments would be designed to retain the appropriate number, size, and distribution of snags to meet habitat goals and Forest Plan standards. If a snag designated for retention must be felled for safety (OSHA), it would remain onsite as coarse woody debris and a substitute snag selected for retention.

- No retention of individual dead lodgepole pine is desired. Groups or clumps of lodgepole snags may be left in inoperable areas or when mixed in with other retention trees.
- All whitebark pine snags would be retained where safe to do so.
- In regeneration harvest units, roughly 20 snags per 10 acres from a mixture of diameter classes available, with seral species preferred, would be retained where they do not pose a safety or feasibility concern; and all snags less than 20 inches dbh would be retained.
- In intermediate harvest units, all snags greater than 20 inches dbh would be retained along with additional smaller snags to average at least 2 snags per acre of the largest, most windfirm snags available. There would also be live trees in various size classes to provide snag replacement and inoperable inclusions where all snags would be retained. The most desirable species for snags are ponderosa pine, whitebark pine, and Douglas-fir.
- In burn units, prescriptions would generally include limiting cutting of snags >12" diameter unless they are a specific safety or line containment hazard.
- The rare remnant snags that may be found in pre-commercial thinning units would be retained.

Aspen: Aspen occurs throughout the project area in many units and proposed treatment types. In rare cases it is the dominant species; in most, it is a minor inclusion. Wherever aspen occurs, it is considered a desirable component and would be enhanced through methods such as removing conifer encroachment within and adjacent to the clone.

5-Needled Pines: Limber pine and whitebark pine occur in the project area. At times, these are present as seedlings and indistinguishable from one another. Whitebark pine is a sensitive species, and limber pine is a rare component subject to similar threats. They are considered desirable components wherever found and would be enhanced to the extent feasible. While incidental damage could occur, these species would not be intentionally cut regardless of size, condition, or distribution. Trees would be protected

to the extent feasible during operations. This may include ensuring that designated skid trails avoid whitebark and trees are directionally felled away. Whitebark would be protected from fire mortality through techniques such as directional felling of slash, pulling slash away, and designing ignition patterns to limit fire intensity. To the extent that funding and rust resistant stock is available, whitebark may be planted where it has been identified as a viable component. Further, these species would be promoted by removing competing conifers, creating more resilient conditions for seed bearing individuals, and creating seedbeds suitable for regeneration.

Ponderosa pine: Ponderosa pine is an important seral tree species. It would be considered the favored species where it occurs, and enhanced by removing competing conifers, creating more resilient conditions by managing structure and density, and creating seedbeds suitable for regeneration.

Old Growth: Old growth is an important habitat component wherever it occurs. Old growth would be generally avoided and protected to the extent feasible.

Tree Selection: Where live residual trees are available, the healthiest, generally largest, windfirm, and most fire resistant seral species would be selected for retention at the desired distribution specified in detailed silvicultural prescriptions. Remnant components would be retained in treated areas utilizing variable retention concepts to provide diversity and habitat features.

Regeneration: Regeneration on NFS lands following regeneration harvest is assured within 5 years of the harvest. The success of regeneration would be monitored with stocking surveys 1st, 3rd, and 5th growing season. Natural regeneration is expected in most units due to serotinous lodgepole cones in the soil and attached to logging debris, and seed trees of other species. In some units, planting may be done to achieve desired species composition of trees with limited living seed source, such as ponderosa or whitebark pine. Planting may also occur to bolster natural regeneration to meet certification standards.

Weed spraying and grazing: These activities would be modified as necessary in regenerating areas to ensure these activities do not compromise the success of regeneration. Specific mitigations would be identified prior to implementation, and may include tactics such as temporary avoidance, modifying the season of use, and modifying the timing of application or selection of herbicides.

Slash Disposal: Sufficient debris would be left to meet coarse woody debris goals and burning guidelines. Excess slash would be disposed of with a variety of methods, including but not limited to whole-tree yarding, chipping, mastication, maximizing utilization opportunities including firewood, and burning.

Streamside Management Zone's (SMZ's): No mechanical equipment would operate in SMZs, but incidental tree removal may occur within allowable SMZ retention regulations. No ignition of prescribed fire would occur within SMZ's, although fire may back into them with low intensity. All treatments would comply with the Montana SMZ law.

Firewood: Logging areas would be open to firewood gathering after the sale is closed, and prior to burning if wood is available and resource values can be protected.

Improvements: (i.e.-fence lines, portals, gates, roads, parking areas, etc.): Improvements would be protected from damage during all phases of implementation.

Prescribed Fire

Post-Harvest Fuel Treatments

- To meet soil standards within cutting units a minimum of 5 tons per acre and a maximum of 15 tons per acre of woody material greater than 3.0 inches diameter on the small end and at least 4 feet in length will be left, evenly distributed and within 18 inches of the ground.
- Within units that will have a prescribed fire treatment following harvest, activity created slash shall be removed from around the base of all designated leave trees for a distance of 12 feet on the sides, 12 feet from above and 12 feet below the boles.
- Fuel breaks shall be created around treatment units that will have prescribed fire treatment following harvest activities; this should include removal of all vegetation material greater than 3 inches in diameter on the large end and 2 feet long or longer in length for a distance of 15 feet from the center of the fuel break. This slash will not be piled or windrowed but either removed from site or scattered so as not to concentrate slash around perimeter of fuel break.
- All species over 3 feet in height not meeting minimum diameter specifications that are damaged beyond recovery by operations shall be cut and slashed within 18 inches of the ground and bucked into lengths shorter than 4 feet.

The following are recommended specifications for pile construction with the use of mechanized equipment:

- Remove residual/commercial firewood products prior to piling. This will limit piles being torn apart from firewood gathers, promote more usage of solid material, and limit impacts to air quality. Firewood products shall be placed at least twice the pile diameter away from any piles to avoid ignitions from burning of pile slash.
- Construct piles at a size-ratio of 2:3, meaning if pile is 10 feet tall it should be 15 feet inches diameter. Pile branches and tops with the butt ends towards the outside of the pile, and overlapping. The perimeter of piles should have very few loose ends meaning all edges of piles are pushed in or sawn off and added to pile. Place sufficient amount of 3 inches and smaller material throughout the pile, this should be approximately 30% of the pile volume. Minimum piling size should be approximately 8 feet across in diameter and 6 feet in height Piles should be kept compact. Do not place large stumps (> 14 inch diameter measured at the cut stump) in the piles
- Do not include foreign objects (garbage), treated lumber, or non-flammable material in the pile. Use a crawler-type excavator equipped with grapple or bucket with a thumb.

- Piles that are to be burned will not be located over buried utility lines. Piles should be in an area void of overstory trees and utility lines. Anticipate flame lengths of up to three times the height of your pile(s). Piles will maintain a minimum spacing of twice the pile diameter from any live overstory vegetation and/or utility lines (includes utility boxes). Piles will maintain a minimum spacing of four times the pile diameter from any structures, creating safety zone where flames, radiant heat, and airborne embers will not set structure on fire. Placement of piles will be in locations that will minimize soil and ash movement.
- Piles are not to be located on active road surfaces, in road rights-of-way, or in ditches. Piles should maintain a minimum spacing of twice the pile diameter from center line of any active road surface.
- Piles will be monitored for post-fire vegetation response and reseeding/re-vegetating burn pile sites may be needed.

Prescribed Fire Control Line Construction

Control lines would be constructed by a combination of methods including hand, mechanical (less than 35 percent slope on NFS lands), and/or explosives to 18-24" wide to mineral soil. Use of natural and existing barriers is preferred. Control line rehabilitation associated with burning activities would consist of pulling back (with hand tools) the berm adjacent to the constructed line, constructing water bars as needed, and disguising rehabilitated line with scattered slash where fireline intersects NFS trails or roads to reduce the likelihood of the line being opened up as an informal trail.

Implementation

Implementation would occur in phases which would generally depend on the weather and scheduling between this and other ongoing projects. In general, landings would be burned within 1-3 years of harvest. Where burning follows harvest, generally the burn would occur within 5 years of harvest; site preparation burns occur within 3 years. Burning in non-harvested areas would occur when weather and fuel conditions meet objectives. Bark beetle conditions in Douglas-fir areas would be assessed prior to burning to ensure burning does not exacerbate indirect mortality from this insect.

- Helicopter – Helicopters may be used to complete prescribed ignition in the Mixed Severity Prescribed Fire treatments and removal of material. This would involve helicopter use primarily directly over treatment units, duration of flights would generally be for two to six hours per day. Consecutive days of ignition would be rare and not expected to exceed five days in a row, with two days being the usual. Removal of material may potentially occur more than two consecutive days. Prescribed Fire treatments will generally occur in the spring or fall when prescription parameters are met. Removal of material would potentially occur at any time of the year. Aerial Ignition and removal of material would generally occur below 500 feet AGL, flight patterns would be directly over units and directly adjacent to units generally within one mile or less of unit boundary. Flights greater than 500 feet AGL could occur to scout units and familiarize pilots, assess effectiveness of ignition patterns, monitor fire behavior, identify material to be removed, and provide an aerial platform for managers and

prescribed fire overhead. Consultation with wildlife specialist would occur prior to ignition for areas with potential wildlife conflicts due to aerial operations.

- Post-Burning: Monitoring would occur after burning to determine if the slashing, piling, pile burning, jackpot burning, or broadcast burning met the objectives to modify fire behavior characteristics and reach desired fuel loading in units.
- Monitoring will also identify areas requiring weed treatments.

Noxious Weeds

For proposed activities on Forest Service lands, the invasive plant design criteria and mitigation measures for this project would follow the guidance contained in the 1986 Forest Plan, The Helena Weed Treatment Project FEIS and FSM 2900. For proposed activities on BLM lands, the invasive plant design criteria and mitigation measures for this project would follow the direction contained in the 2008 BLM Butte Field Office Weed Management Plan Revision EA.

- Remove all mud, dirt, and plant parts from all off road equipment before moving into project area. Cleaning must occur off National Forest lands. This does not apply to service vehicles that will stay on the roadway, traveling frequently in and out of the project area.
- Re-establish vegetation on bare ground due to construction and reconstruction activity to minimize weed spread. Use native material where appropriate and available.
- Minimize the movement of existing and new weed species caused by moving infested gravel and fill material. All gravel and borrow sources should be inspected and approved before use and transport. The source will not be used if the weeds present at the pit are not found at the site of intended use. If weeds are present, they must be treated before transport and use.
- Ensure that weed prevention is considered in all timber projects and all prescribed burning.

Recreation

Public Safety and Communication

- Portions of the project area, roads and trails may be restricted for safety purposes during operations. Site specific public safety plans would be developed in advance of operations. These plans should include such things as signage, area and route closures, stakeholder notification, contacts and public announcements.
- Incorporate a variety of public educational and interpretative programs and materials throughout project implementation that would focus on benefits of this project to the overall health of the ecosystem and landscape. The educational and interpretive programs and materials would be based on the purpose, goals and audiences we aim to serve and can include interpretive panels, guided field tours, virtual tours, community programs/lectures, and other community-based opportunities.

- Log haul during weekends and holidays would be avoided. Log haul would be limited during the school year (07:00 to 08:30 and 15:30 to 17:00) in residential areas. These specific routes would be identified during implementation and/or if conflicts arise during implementation, additional restrictions may be necessary.
- On roads open to the public, dust abatement and blading would occur as needed on main haul routes. This need would be based on public safety, not user comfort, and at the discretion of the Contracting Officer in consultation with the Forest Engineer.

General

- Implementation would focus on geographic areas to ensure that recreation opportunities remain available across the project area. Large scale or long duration (greater than one season) operations requiring trail or recreation area closures should not occur concurrently across the project area. For example, if it's necessary to close the area and trails between Grizzly Gulch and the Mountain Helena Ridge, efforts should be taken to keep the area and trails between Grizzly Gulch and Orofino open to provide a non-motorized recreation opportunity in the area South of Helena. Shorter duration closures (one month or less) and/or weekday closures may be necessary on a larger scale, concurrently to facilitate efficient and timely implementation of the project. Recreation staff would work with local user groups to identify alternate routes where available.
- Recreation improvements and facilities would be inventoried prior to implementation and protected to minimize damage during implementation. If incidental damage does occur it would be necessary to restore these sites to pre-implementation condition upon completion of area activities.
- To the extent possible use of developed, dispersed recreation sites or trailheads for landing sites, burn bays or any other similar use would be avoided. If it is unavoidable, a plan for rehabilitation would be made in advance of use. These sites should not be used for extended periods (beyond a season) and should generally be rehabilitated within one year from beginning of use. A rehabilitation plan would be developed by resource specialists prior to use of these areas, this plan may include such things as season of use, removing debris, re-contouring disturbed areas, seeding, weed treatment, and resurfacing parking areas.
- To reduce the potential for establishment of user created routes, minimize the placement of skid trails and prescribed fire control lines in road and trail corridors. Where they cannot be avoided rehabilitation must be completed timely to ensure the public does not begin using them for motorized or non-motorized recreation. The rehabilitation plan should include returning to natural contour, scarification, seeding with native mix and installing natural barriers. These routes would need to be monitored over time and additional barriers placed if a pattern of use begins.

Hunting Season

- Motorized and mechanized operations in remote locations (generally greater than ½ mile from a route designated open to the public for motorized travel or private

property) would be minimized on NFS lands during big game rifle hunting season (approx. 10/15 – 12/2) to reduce the impact on hunters. Operations should generally be avoided the first two weeks of rifle season. When conflicts with other resource objectives or efficiency of operations require activity to occur during rifle hunting season, the public would be notified and signs would be posted in advance.

- Log haul on routes closed to the public during big game rifle hunting season would be avoided. Administrative travel may occur however when possible it should be limited to the hours of 10:00 to 15:00.

Trails

- A Recreation Specialist would provide site specific input during layout and design of treatment units in high value scenic corridors such as the area surrounding the Continental Divide National Scenic Trail (CDNST) and trails located in the City of Helena South Hills. Public safety, recreational characteristics and aesthetic values should be given consideration in design of these treatment units.
- Prescriptions defining the treatment of slash within trail corridors (visible foreground immediately adjacent to route) should include consideration for aesthetic values. In situations where trails are currently located on a road prism that could be used during implementation, consider relocating segments of the trail to more desirable locations. Trail relocation may also be considered when activity, that would likely be disruptive or visible long-term, is anticipated to occur in the trail corridor. Trail relocation will be considered in more detail in the Final EIS for this project.
- If the trail width is expanded to facilitate operations it would be restored to a desired width post implementation.
- Character trees and trees that define the trail corridor would be retained when they do not compromise safety.

Decommissioning of Roads

- Roads to be decommissioned, which also serve as a designated system trail, would be restored to a condition to ensure recreation values are enhanced post implementation. Consultation with Recreation Specialist prior to decommissioning would be required.
- Roads to be decommissioned, which are not designated system trails, would consider recreation uses and on a case by case basis implementation may include leaving a flat walking surface or lighter ripping to facilitate non-motorized use post implementation.

Transportation

- Roads would receive pre-haul maintenance as needed to restore the cross slope and to clean culverts and ditches. The roads would also be maintained during and after log haul.
- Logging operations during winter conditions and potential for sediment delivery during snowmelt or runoff would require the need for compliance with road

maintenance, construction, and snow plowing environmental conservation measures.

- Road Reconstruction:
 - Road surface improvements would be maintained at minimum haul standards with graveled surface not rutted and effective drainage for the duration of the project.
 - Road reconstruction and maintenance would be done in accordance with standard BMPs (USDA 1988a; USDA 1988b; USDA 1994; USDA 2012) and project-specific practices described in the soils specialist report in a way that aids and improves the effectiveness of decommissioning following project completion.
 - Road surface drainage would divert most road-surface runoff to undisturbed forest floor, where conditions allow for sediment deposition and infiltration.
- All temporary roads would be decommissioned after sale activities are completed.
- All temporary roads would be closed (i.e. gates, barricades) to public motorized access at all times.

Visuals

- Blend units including fuel breaks with natural landscape features such as natural openings, rock outcrops, and topography. Harvest units should be shaped to mimic natural patterns found in the landscape. Straight lines or geometric shapes should be avoided. Unit edges should be natural appearing, to mimic the adjacent natural landscape character (undulate/feathered).
- Temporary road locations should be designed to fit the landscape with a minimum degree of landform alteration limiting the amount of earthwork. Planning and design of alignments should consider minimizing impacts to scenic resources.
- In units with M-1 management areas, burned areas should have a mosaic of burned and unburned islands. (Agriculture Handbook, # 608, pg. 28 and 29)
- Disturbed areas, including but not limited to temporary road, landing construction, scars from burn piles etc. would be re-vegetated after the site has been satisfactorily prepared.
- All equipment and construction debris would be removed from the site.

Roads / Skid Trails:

- Sidecast topsoil during the construction of temporary roads and use for later obliteration and recontouring.
- Where new access roads and skid trails meet a primary travel route, they should intersect at a right angle and, where feasible, curve after the junction to minimize the length of route seen from the primary travel route.
- Where feasible, retain screening trees one tree-height below roads and landings (including portions of cable units). Avoid creating a straight edge of trees by saving clumps of trees and single trees with varied spacing.
- Cut and fill banks will be sloped to accommodate natural revegetation.
- Cut and fill slopes will be revegetated with native species where ever possible.

Slash:

- Ensure slash is abated near landings by burning, scattering, chipping, or other techniques.
- If slash piles are to be burned, take necessary actions to achieve 95% or more consumption. Following burning, concentrations of unconsumed slash would be scattered. Maximize utilization and removal of fuel to reduce the amount of slash to be burned.

For units that have VQO's of Retention and Partial Retention or are seen from sensitive viewing areas including the CDNST, trails and roadsides, the Forest Landscape Architect will work with the Silviculturist, Planning Forester, and Fire Management Staff on the design and layout of units to accomplish:

- Utilize designation by description (species designation) where appropriate to minimize the amount of necessary marking paint.
- Minimize skyline corridors and work with the Landscape Architect to blend the resulting corridors in with the surrounding environment. This can be achieved through the silvicultural prescription and design/layout.
- Use cut tree (as opposed to leave tree) marking in visually sensitive areas where appropriate.
- Log landings, roads, gravel pits, borrow areas, and bladed skid trails should be minimized within sensitive view sheds.
- Aesthetic values should be considered when selecting landing locations. Project manager should consult with the Landscape Architect during implementation on NFS lands to identify options to minimize impacts in visually sensitive areas.
- Where feasible road or trail closures should be considered to allow short-term landing and decking on the road to reduce the extent of disturbance.
- In visually sensitive areas consideration should be given to processing trees within the unit and only decking adjacent to roadsides.
- The views of skid trails should be minimized.
- When appropriate, use Jack leg fence or natural barriers to block reclaimed skid trails and temp roads from further use.
- In sensitive foreground areas: for hand treatments, stumps shall be cut to 8 inches or less. Stumps shall be cut as low as possible (8 inches or less is preferred) when mechanically treated and when restricted by terrain, such as boulders or rock.
- Slash, root wads and other debris will be removed, burned, chipped or lopped to a height of 2 feet or less. The effect of scattering the slash should mimic the adjacent natural environment.
- Slash damaged residuals below the lowest live limb.
- Aesthetic values should be considered when determining the method to mark unit boundaries. When possible use flagging or description. If painting is necessary use water based paint.

Range

- Project implementation activities on NFS lands would be coordinated with range personnel prior to grazing season (July 1 to October 15) to avoid conflicts.
- Cattle would be prohibited from entering selected units following treatment activities (burning, and planting) during a “rest period” lasting at least one growing season to allow for vegetation to reestablish.
- Fencing, either temporary or permanent, may be needed to protect stands after burning or where natural barriers have been lost due to implementation. This would be coordinated with the wildlife biologist, if deemed necessary.
- After implementation of activities have taken place, all livestock watering improvements and fences that were affected would be replaced or repaired to the condition in which they were found.

Watershed/Hydrology

Road Reconstruction and Maintenance

- Road reconstruction and maintenance would be done in accordance with standard BMPs (USDA 2012) to disconnect or minimize existing and avoid developing new sediment delivery points.
- Adequate stream culvert capacity would be ensured (USDA, 1991; USDA, 2014)
- Project-area road segments with sediment delivery points (as identified in pre-implementation surveys) should be repaired using appropriate measures (e.g. blading, grade dips, gravel surfacing, slash-filter wind-rows, straw bales)
- Road surface improvements would be maintained at minimum haul standards with an unrutted gravel or native surface and effective drainage for the duration of the project, and at the end of project activities
- Road surface drainage would divert most road-surface runoff to an undisturbed forest floor, where conditions allow for sediment deposition and infiltration (topography likely prevents diversion of 100 percent of road surface runoff, especially at mid-slope culvert crossings).

Temporary Roads

- New temporary road construction would be in accordance with standard BMPs (USDA 2012) in a manner that aids the effectiveness of decommissioning following project completion. These roads would be fully decommissioned after sale activities are complete.
- Temporary roads would be constructed outside of wet areas and with no or minimal stream crossings. Roads would be located to avoid adverse effects to soil, water quality and riparian resources.
- If a crossing is required over a stream channel, including intermittent drainages, a Streamside Protection Act (SPA) permit, CWA section 404 permit, and any other applicable permits would be obtained prior to implementation

- Until temporary roads can be decommissioned, they would be maintained to minimum haul standards in order to minimize the potential to develop sediment delivery vectors
- If temporary roads are to be left open over winter they should be winterized using appropriate surface stabilization methods, including waterbars, crossdrains and scattering of slash.

Water Quality Design Criteria

- During road decommissioning or culvert replacements, measures to prevent damaging levels of sediment from entering streams would be undertaken, such as: (a) placing removable sediment traps below work areas to trap fine sediment; (b) when working instream, removing all fill around pipes prior to bypass and pipe removal (where this is not possible, use non-eroding diversion); (c) revegetating scarified and disturbed soils with weed-free grasses for short-term erosion protection and with shrubs and trees for long-term soil stability; (d) using erosion control mats on stream channel slopes and slides; (e) mulching with native materials, where available, or using weed-free straw to ensure coverage of exposed soils; (f) dissipating energy in the newly constructed stream channel sections using log or rock weirs; and (g) armoring channel banks and dissipating energy with large rock whenever possible.
- All wetlands, seeps, and springs should be identified and marked during project implementation
- Exclude equipment/trucks from wetland areas unless during winter conditions as specified in the Tenmile-South Helena Project Soils Specialist Report
- Landings, skid trails, and slash piles would be located in suitable sites to avoid potential for erosion and sediment delivery to nearby waterbodies. Skid trails would not be placed within SMZs or landslide-prone areas. Only existing landings would occur within SMZs.
- Erosion control and sediment plans would cover all disturbed areas, including skid trails and roads, landings, cable corridors, temporary road fills, water source sites, borrow sites or other areas disturbed during harvest operations.
- Install sediment and stormwater controls prior to initiating surface disturbing activities to the extent practical.
- Contractors would have spill prevention and containment materials on site to minimize the risk of an accidental spill of petroleum products, as well as to protect water courses and aquatic biota from adverse effects in the event of a spill.
- Avoid hauling and other heavy-equipment traffic during conditions where the road surface is at or near saturation (i.e. avoid causing ruts in road surface).
- Sediment filtering devices (e.g. wattles, weed-free straw bales, filter fence) should be used as needed to limit erosion and delivery of sediment from roads into streams or ephemeral drainages where such delivery cannot be avoided through road improvement measures.
- Minimize cleaning of vegetated ditches that are still functional

- Areas cleared of vegetation by maintenance or other activities should be seeded with an approved weed-free seed mix
- Sediment filtering devices (e.g. wattles, weed-free straw bales, filter fence) should be used as needed to limit erosion and delivery of sediment into streams or ephemeral drainages
- Upon completion of pile burning, install log erosion barriers or wattles where deemed appropriate by Soils or Hydrology staff in order to prevent potential runoff from burn sites
- Areas cleared of vegetation by maintenance or other activities should be seeded with an approved weed-free seed mix
- For jackpot and/or pile burning treatments, locate burn piles at least 100 feet from stream channels. For broadcast burn units, apply a 100-foot no-ignition buffer unless specified differently in the soil or hydrology analysis

Snowplowing:

- Leave a minimum of two inches of compacted snow on the road surface.
- Do not side-cast snow into any stream channel.
- Leave drainage points (breaches) in the snow berm to avoid concentration of snowmelt runoff on the road surface.
- Do not operate vehicles or equipment on snow-covered roads during warm/soft conditions to avoid setting ruts.

Fisheries

- Montana Streamside Management Zone (SMZ) law will be followed. Any application for an alternative practice will be reviewed by Forest Service (FS) fisheries and/or hydrology personnel.
- On NFS lands, follow Forest Service BMPs where applicable.
- Trees to be removed as part of salvage, that are not needed for woody debris recruitment or floodplain needs, can be removed, but tree retention requirements must be maintained.
- Salvage trees should not be cut when they are in an SMZ, leaning away from the road, and within a tree length of the stream or a bank edge tree.
- Log landings and slash should be placed only in dry, upland locations outside the SMZ.
- Where ground-based mechanical treatment is proposed, equipment would not operate in the stream buffers except when the ground is frozen or there is adequate snow per Rule 4 of the MT SMZ regulations, or where an Alternative Practice with mitigations is obtained from DNRC.
- Any crossing of a stream channel, if approved by MT DNRC in an Alternative Practice, would be done in a manner that prevents stream bank or channel bottom disturbance (i.e., logs, rubber matting).
- Blade, compact, and restore/improve surface drainage on roads in the project area and along haul routes outside the project area.

- Where pile burning is constrained in SMZ's, consider chipping and dispersing fuels.
- If operating machinery outside a unit boundary is needed during implementation to minimize resource impacts, a site specific review will be performed by specialists and the deciding official.

Soils

- Operations (ground based and cable/skyline) would be conducted when soils are generally dry (as determined by a qualified Forest Service Representative), or during "winter-conditions". Winter conditions are defined as a minimum of six inches of frozen ice/snow OR a minimum of six inches of frozen soil. Wetlands are excluded from operations.
- Log landings and slash material would be placed only in dry, upland locations rather than wet areas.
- Ground-based heavy equipment operations would be limited to slopes less than 35 percent gradient located on NFS lands, excluding steeper, short, isolated units that are determined to present no harm to the overall soil resource (USDA FS 1988 - BMP 13.02 and 14.07).
- On slopes greater than 35 percent gradient located on NFS lands, larger in area than the above short, isolated units, use hand-falling and lead-end suspended log yarding operations, such as skyline cable or helicopter yarding (USDA FS 1988 - BMP 14.09).
- To sustain long-term soil nutrient cycling, retain a minimum of 5 tons per acre of coarse woody material (greater than 3-inch diameter) following treatments in warm, dry forest habitat types, and a minimum of 10 tons per acre in all other forest types (Graham et al. 1994, Brown et al. 2003).
- Conduct prescribed burning when the forest floor is moist (Harvey et al. 1994).
- Potential cumulative effects of livestock grazing in proposed treatment units would be mitigated by deferring grazing for at least 1 to 2 years following vegetation treatments. This would minimize possible cumulative effects of grazing and vegetation treatments.
- Design burn prescriptions to retain adequate ground cover that would limit surface erosion rates to comply with Region 1 soil management guidelines of generally less than 1 to 2 tons per acre per year. Greater than 40% ground cover should be retained to prevent detrimental accelerated erosion following prescribed burning (Johansen 2001). Ground cover can include: plant duff or litter, coarse woody material that is in contact with the ground, basal vegetation, and rocks greater than 2 inch diameter.
- Design burn prescriptions to achieve low to moderate fire intensity (USDA FS 1988 - BMP 18.02, Harvey et al. 1994).
- Following implementation of proposed vegetation treatments (including road construction and road decommissioning), sites would be monitored for noxious weed invasion, and subsequent weed treatments would be conducted to control

and eradicate weeds. With this mitigation, soil cumulative effects from noxious weeds would be minimized.

- Many of the access roads in the project area had roadside hazard trees removed recently as part of the Forest-wide hazardous tree removal project. These narrow strips overlap with many planned treatment units. Generally, very few if any additional trees would be cut in the overlap areas, but equipment may need to operate in them to facilitate tree removal for the rest of the unit. Impacts would be mitigated by utilizing the same landings and skid trails to the extent that it is feasible.
- Construct prescribed fire control lines to the minimum size and standard necessary to contain the fire and meet overall resource objectives.
- Locate and construct prescribed fire control lines in a manner that minimizes erosion by considering site slope and soil conditions, and using and maintaining suitable water and erosion control measures.
- Avoid building prescribed fire control lines in or around riparian areas, wetlands, marshes, bogs, fens, or other sensitive water-dependent sites unless needed to protect life or property.
- For all planned broadcast burn units, field evaluations would be completed to determine DSD from mechanical activities. This site visit would determine the burn prescription specific to burn severity to soil. All prescriptions would be designed to minimize DSD and meet Regional Standards.
- In order to meet Regional soil quality standards these units would require post-mechanical treatment soil monitoring and potential deferred burning with either summer or winter mechanical operations.
 - Alternative 2: Units 1, 3, 5, 11, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 26, 27a, 27b, 29, 30, 31, 32, 33, 35, 36, 39c, 49a, 84b, 85c, 97a, 98c, 98g, 98h, 104, 106a, 106c, 106e, 106g, 118 and 130
 - Alternative 3: Units 11, 14, 15, 18, 19, 23, 39c, 106a, and 110b
- In order to meet Regional soil quality standards these units would require either A) summer mechanical operating conditions with post-mechanical treatment soil monitoring and potential deferred burning or B) winter mechanical operating conditions.
 - Alt. 2: Units 4, 6, 7b, 7d, 8g, 8k, 8n, 8q, 9b, 27c, 39b, 39i, 39s, 40, 50, 56a, 56b, 58, 59a, 71, 73b, 73c, 73d, 73e, 75, 76, 78, 81, 85a, 85b, 89c, 94a, 94d, 94e, 94f, 94g, 100a, 100c, 101, 102a, 103a, 106b, 106d, 106f, 106h, 112, 114a, 114b, 116c, 116h, 116i, 121, 124a, 124b, and 129a
 - Alt. 3: Units 4, 5, 6, 16, 17, 20, 22, 24, 29, 29a, 33, 35, 50, 58, 71, 73b, 73d, 75, 76, 78, 101, 114a, 114b, 117, 121, 175, and 180
- In order to meet soil quality standards these units would require winter mechanical operating conditions with post-mechanical treatment soil monitoring and potential deferred burning.
 - Alt. 2: Units 39g, 49c, 51, 73a, 84c, 110a, 110b, 110c, 117 and 138
 - Alt. 3: Units 51, 73a, and 138

- Unit 69: To maintain compliance with Region 1 soil quality standards, tractor yarding would reuse existing disturbance to the extent possible to minimize new soil disturbance. To achieve a net improvement in soil quality within unit 69, both fine and coarse woody material would be retained following tree thinning, and soil restoration measures would be implemented on disturbed soil and could include recontouring areas of soil excavation, subsoiling, re-spreading topsoil, seeding, mulching, and treating noxious weeds.

Wildlife

Design Criteria/mitigation measures directly connected to Forest Plan standards and guidelines include the following and are applicable to only NFS lands:

- Recommendations from the Final Report of the Montana Cooperative Elk-Logging Study, 1970-1985 for Coordinating Elk and Timber Management would be employed during timber harvest wherever they are relevant and do not seriously subvert the project purpose and need:
 - To provide elk with habitat options, logging activity will be confined to a single drainage at a time—with the exception of broad ridgetops that, while technically split down the middle between drainages, actually function as distinct habitat units. All work will be completed in the shortest time possible.
 - Logging operations will be limited during the big game rifle season [generally mid-October-late November] so as to maintain big game habitat capability and hunting opportunity.
 - All temporary roads will be closed to public vehicles.
 - Recreational firearm use will be prohibited for anyone working in an area closed to the public.
 - Slash within cutting units will be reduced below 1.5 feet so as not to inhibit forage development and impede movement by elk.
- Forest Plan standards for snags will be met for local 3rd order drainages by virtue of the abundance of mature beetle-killed trees in untreated stands surrounding project cutting units. This will provide dead trees well in excess of the Forest Plan minimum average of 2 snags/acre in 3rd order drainages and will also be in line with Estimates of Snag Densities for Eastside Forests in the Northern Region (Bollenbacher et al. 2008).

General Design Criteria for Wildlife

- All prescribed burns and underburning will be implemented prior to May 1 or after July 31 in order to protect nesting birds, unless surveys indicate nesting birds are not present.
- If any listed or proposed threatened/endangered species are detected in the project area, project activities will be examined to determine if modification is necessary.
- If active elk calving areas are identified prior to or during project implementation, no disruptive project operations will occur in those parts of the project area from mid-May through the end of June unless surveys indicate the areas are no longer being used.

- A buffer zone of uncut forest will be established around any active goshawk nest near treatment units. The size and configuration of this zone will depend on the location of the nest, the distribution of green overstory trees, and other local factors to be assessed by the wildlife biologist at the site. If possible, the buffer around an active nest tree should be at least 40 acres.
- No ground disturbing activities will occur inside known goshawk post-fledging areas from May 1 through August 15 to protect the goshawk pair and young from disturbance and habitat alteration until fledglings are capable of sustained flight. Site-specific data will continue to be used and if needed, timing restrictions will be designed to reflect variations in fledging dates.
- In regeneration harvest units, roughly 20 snags per 10 acres from a mixture of diameter classes available, with seral species preferred, would be retained where they do not pose a safety or feasibility concern. All snags greater than 20 inches dbh would be retained. There would be a few reserve trees/patches and inoperable areas to provide snags and/or replacement trees.
- In intermediate harvest units, snag retention goals would be to retain all snags greater than 20" dbh; AND 7 ponderosa pine or Douglas-fir snags greater than 10" dbh, or as many are available less than that amount, where they do not pose a safety or feasibility concern.
- A retention of 5 tons/acre of down woody debris (greater than 3 inch diameter) following treatments in warm, dry forested habitat types and a minimum of 10 tons/acre in all other forest types would ensure adequate habitat for down woody debris-dependent species (i.e., marten).
- In addition to following Hydrology and Soils guidelines, vegetation treatment in and around riparian and wetland sites will retain enough healthy live trees, snags, and coarse woody debris to provide viable habitat for dependent wildlife species. Most often, all of these components will be left intact: In some instances, live conifers will be removed to promote aspen and to restrict colonization of wet meadows. The zone of restricted treatment around wet sites will vary with local circumstances but will generally be in the range of 1-2 tree lengths. These sites, which include subirrigated habitats as well as those with standing water, provide some of the best remaining enclaves of green forest in beetle-impacted areas.
- In areas impacted by mountain pine beetle, forest stands or portions of stands with a preponderance of healthy, green trees in the overstory will be left untreated or will be treated so as to protect the live overstory component whenever the result enhances local wildlife habitat and does not compromise the purpose and need of the project. Priority areas include saddles, travel lanes, stands adjacent to riparian and wetland habitats, and sites within elk security areas.
- In beetle-impacted lodgepole pine habitats, concentrations of healthy conifer regeneration will be protected whenever possible in order to preserve existing or potential concealment cover, pockets of local habitat diversity, and maturing forest habitat.
- Within treatment units, viable aspen of all ages will be protected from damage generated by cutting and burning operations as much as possible. Coarse woody

debris will be left in place in and around aspen stands where practicable to make it difficult for native ungulates to browse on and suppress young aspen.

- Treatment patterns will favor aspen over green conifers in the vicinity: conifers that appear likely to suppress the development of promising aspen clones will be removed.
- Whitebark pine is an important wildlife resource: live trees in any stage of development will be protected wherever they occur within treatment units to the extent practicable.
- All temporary roads will be decommissioned after the project. Decommissioning of roads will ensure no future loss of elk security or sediment movement to streams.

Within elk security areas and in travel zones that elk use to move between security areas, it is desirable to preserve as much viable, long-term cover as possible and to foster habitat conditions that favor rapid recruitment and improvement of cover in areas where it is limited. Abundant cover is most valuable in areas known to be frequented by elk: saddles, low divides, drainage-heads, riparian/wetland sites, and the upper third of slopes in large drainages.

“Cover” includes (1) “hiding cover” provided by conifers capable of hiding 90% of a standing elk or deer at 200 feet; (2) “screening cover”, which, while less effective than hiding cover, can obscure the view toward standing or moving animals; and (3) “concealment cover”, which, can hide calves/fawns and bedded adults. Concealment cover may consist of young conifers, low shrubs, or fallen woody debris. Such debris may also serve to impede access by hunters into security areas.

Sensitive Plants

- Hall’s Rush is also known from three harvest units in the project area. For these populations, ground disturbance would be avoided.
- Ground reconnaissance of sensitive plant habitats within treatment units has not occurred to date. Surveys would be conducted by the appropriate field crews in representative habitats within treatment units prior to the final decision. If any undocumented sensitive plant populations are found prior to or during implementation, those populations would be buffered and protected using design criteria as appropriate for the species.
- Weed treatment, such as herbicide application, would be consistent with guidance from the Helena National Forest Weed Treatment Project FEIS (USDA 2006) on NFS lands and the 2009 BLM Butte Field Office Weed Management Plan Revision EA (USDI 2009) on BLM lands such that sensitive plant populations would be protected.
- Maps of known populations within the project area would be reviewed prior to each implementation season.

Heritage

- National Heritage Protection Act compliance must be completed prior to project implementation. When phased surveys are completed, the heritage survey

implementation plan would be updated and forwarded to project proponents. The heritage specialist will provide site location maps to field crews for review before unit implementation. Historic properties or unevaluated cultural sites will be avoided by project activities or mitigated through additional consultation per 36 CFR 800. If new cultural sites are located during project implementation, an archaeologist would be contacted to review the site and would determine appropriate site protection measures. If these mitigation measures are followed, then it is recommended that the project be allowed to proceed as a No Adverse Effect activity. However, if the scope of work changes or any additional cultural resources are encountered during implementation of this project, then work should stop in the area and the forest archaeologist be contacted. Work in that area can only resume if mitigation measures can be determined and/or re-evaluated if necessary.

- Mitigation measures to reduce cultural resource impacts caused by temporary road construction may need to be developed especially when located near or crossing historic ditches, such as The Park Ditch (24LC1048/24JF726).

Minerals

- Minerals personnel will provide maps of known reclaimed and un-reclaimed mine sites, hazardous mine openings, discharging adits and active Plan of Operations areas to implementation resources annually prior to field season.
- Forest Minerals personnel will coordinate with the Environmental Protection Agency.
- Heavy equipment would avoid tracking over reclaimed areas, and over un-reclaimed waste rock or tailings piles.
- Provide for vegetative buffer zones, or use slash as surface cover around waste piles and reclaimed areas to reduce the potential for erosion from these areas in the event of a high intensity storm or extreme runoff event post vegetation treatment.
- Provide for vegetative buffers zones and avoid tracking of heavy equipment around adits discharging water to limit alteration of flow conditions.
- Treatment areas where mining workings are known or suspected could be inventoried prior to treatment activities to identify potential mine related hazards. Identified hazards would be flagged by Forest Minerals personnel.
- Avoid constructing burn piles (hand or mechanically generated) or the tracking of heavy equipment over mine features that have been closed with polyurethane foam product.
- Coordinate timber harvest, other vegetation treatment and commercial log hauling activities with active mining claimants conducting mining related activities under an approved Plan of Operations.
- Any previously unidentified abandoned-inactive mine features discovered during implementation should be reported to Forest Minerals personnel as well as the Archaeologist.

- Forest Service On-Scene-Coordinator (OSC) assigned to the EPA led “Upper Tenmile Creek Mining Area” Superfund Project (CERCLA – NPL Site) will serve as liaison to ensure communication and coordination of project efforts is maintained.
- Coordinate timber harvest, other vegetation treatment and commercial log hauling activities with appropriate removal action and/or remedial design project managers as identified by the EPA Remedial Project Manager (RPM).

Lands and Special Uses:

Boundary

- Boundary lines would be established as needed when in question and/or when working in close proximity to adjacent third-party lands that are not well marked.
- Corner monuments and accessories to corner monuments would be protected.
- Adjacent landowners would be notified of project activities. Private landowners would have adequate notice prior to tree harvesting or prescribed fire treatments to plan accordingly for associated noise and potential air quality effects of burning.

Non-recreation Special Uses

- Permittees and landowners would be notified of the proposed and selected actions to ensure that project activities do not materially interfere with private landowner/permittee rights. Privately owned improvements would be protected during operations.
- If detours or temporary road closures occur during project activities, signs and prior warning would be given to affected parties.
- Project managers and contractors would need to be cognizant of the location of permitted private roads and classified private roads, particularly if permission is not granted to use private roads to contractors involved in harvesting activities or to access prescribed fire units.
- The burn boss would determine how many acres could be burned and identify any effects on residents located downwind of the project burn area.

Rights of way/private land

- Road use would be coordinated with Lewis & Clark and Jefferson Counties on roads having county jurisdiction.
- Private rights-of-way would be pursued with both short-term project access needs and long-term public and administrative access needs in mind.
- Private landowners would be made fully aware of project activities and the timeframe in which they would occur.

Air Quality

- Section 190 of the Clean Air Act requires the EPA to issue technical guidance on Reasonably Available Control Measures (RACMs) and Best Available Control Measures (BACMs) for prescribed fires. RACMs and BACMs would be incorporated into all planned burning activities associated with treatment units.

- Prior to initiating any burning activities, a burn plan in compliance with the Montana/Idaho Airshed Group Operating Guide would be prepared for areas proposed within Alternatives 2 and 3.
- Location, timing, and possible smoke effects would be disclosed in the local newspaper and to local residents prior to burning.
- During the burn implementation periods, the prescribed burn boss would be responsible for monitoring site specific smoke analysis with current weather and air quality conditions prior to ignition. Using that information, the burn boss would determine how many acres can be burned and identify any effects on residents located downwind of the project burn area.
- Coordination of prescribed fire activities in other project areas would take place to ensure the amount of smoke would be manageable if multiple units across the project area were burned.

Site-specific Forest Plan Amendment

Implementation of any of the action alternatives would require a site specific amendment to the 1986 Helena National Forest Plan (Forest Plan) for lands encompassed by the Tenmile - South Helena Project. This site-specific amendment would exempt the Tenmile South Helena Project from the following standards (see the Wildlife Specialist report for additional information):

- Forestwide Big Game Standard 3 for thermal cover on winter range (Forest Plan p. II/17) for the Jericho, Black Mountain-Brooklyn Bridge, and Quartz Creek elk herd units. This standard requires that thermal cover on winter range be maintained at or about 25 percent in blocks of at least 15 acres.
- Forestwide Big Game Standard 4a for open road densities during the big game hunting season (Forest Plan p. II/17-18) for the Jericho, Black Mountain-Brooklyn Bridge, and Quartz Creek elk herd units.
- Forestwide Big Game Standard 4c, winter range (Forest Plan p. II/18) for the Jericho, Black Mountain-Brooklyn Bridge, and Quartz Creek elk herd units. This standard requires that all winter ranges will be closed to vehicles between December 1 and May 15.
- Forestwide Big Game Standard 6, Montana Elk Logging Study Recommendations (Forest Plan p. II/19). This standard requires that the recommendations embodied in the Montana Cooperative Elk-Logging study (Appendix C of the Forest Plan [C/1-11]) be followed during timber sale and road construction projects. There are a total of eleven recommendations of which two would need a site specific amendment:
 - Clearcuts – this recommendation is intended to ensure that forage produced through clear-cutting is available to elk by limiting openings to 100 acres or less (page C/7).
 - Winter range – This recommendation states that timber harvest should be scheduled outside of the winter period (page C/10).
- Management Area W-1 – This requires that adequate thermal and hiding cover adjacent to forage areas is provided; this generally means providing at least 25

percent [thermal] cover, where available, on identified winter range (Forest Plan p. III/50).

- Management Area H-1 - This requires that adequate thermal and hiding cover adjacent to forage areas is provided; this generally means providing at least 25 percent [thermal] cover, where available, on identified winter range (Forest Plan p. III/18).
- Management Area H-2 - This requires that adequate thermal and hiding cover adjacent to forage areas is provided; this generally means providing at least 25 percent [thermal] cover, where available, on identified winter range (Forest Plan p. III/21).
- Management Area L-2 - This requires that adequate thermal and hiding cover adjacent to forage areas is provided; this generally means providing at least 25 percent [thermal] cover, where available, on identified winter range (Forest Plan p. III/14).

Management Area T-3 – (1) This requires that thermal cover adjacent to forage areas is maintained (Forest Plan p. III/39); (2) Maintain a minimum of 35 percent hiding cover for big game; and (3) Openings created by timber harvest will be reforested to the extent necessary to meet the hiding cover requirements of big game before harvesting adjacent areas.

Any site-specific amendment to the Helena National Forest Plan would follow the amendment procedures in 36 CFR 219 and would only be applicable to the Tennile – South Helena Project decision.

Implementation Strategy

Within the project area, implementation would occur in phases, the timing of which would generally depend on scheduling with other activities in the area, as well as the weather. For either action alternative, project implementation may take up to 15 years.

Most of the proposed mechanical treatments would occur during initial implementation of the project (two to four years). This approach would allow for achievement of treatment objectives over the greatest percentage of the project area in the shortest amount of time.

Implementation would be phased across the project area and would require, in some cases, portions of the project area be closed to the public for safety reasons. As much as possible, phasing implementation would limit closures to localized geographic areas, while other portions of the project area would remain available for public activities.

Monitoring

Monitoring and evaluation on NFS lands would compare the project outcomes to Forest Plan and BMP requirements. Monitoring and evaluation would be done as described in the Forest Plan and individual specialist reports. The monitoring plan for the Tennile – South Helena Project will be included in the Record of Decision.

Alternatives Considered but Not Given Detailed Study

Federal agencies are required by the Council on Environmental Quality (CEQ) to rigorously explore and objectively evaluate reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14 (a)).

Public comments received during scoping provided suggestions for alternative methods for achieving the purpose and need for action. Some of these alternatives were outside the scope of the purpose and need for action, similar to the alternatives considered in detail, or were determined to cause unnecessary impacts. Therefore, a number of alternatives were considered but dismissed from detailed study for reasons summarized below.

No Burning

A few comments were received that expressed concern about the effects of smoke produced by prescribed fire on air quality in and around the City of Helena. Another related concern to prescribed fire had to do with how prescribed fire activities would be accomplished within allowable times to burn given the amount of prescribed fire proposed and limited time burning is allowed within air-sheds. To address these concerns the interdisciplinary team considered an alternative that would eliminate prescribed burning in all units in the Tennile – South Helena project area. Upon review of a no burning alternative and based on the best available science and data, the team found that it would be unlikely to reduce the probability of high-severity wildfire, create a mosaic of vegetation and fuel structure, and improve conditions for public and firefighter safety across the landscape in the event of a wildfire. The proposed fuel reduction techniques focus on reducing the potential for crown fires and high intensity surface fires in treatment units through the use of vegetation and prescribe fire treatments. The combination of these efforts will move treated units closer to historical conditions by creating a mosaic of age class, stand structure, and reintroduction of fire. Reinhardt et al (2008) found that it is possible to craft treatments that achieve both ecological restoration and fire hazard reduction, but ecological restoration will also include reintroducing fire and other active management. The most effective treatments should include prescribed fire (Reinhardt et al 2008). In doing so, treating the proposed areas with prescribed fire will reduce existing and future hazards to firefighters and the public. Furthermore, implementation of the alternatives, as demonstrated in the smoke modeling with incorporated design features, would be in compliance with the land management plans and complying with air quality standards by not causing or contributing to any exceedances or violations of Federal or State standards and by cooperating with the Montana Air Quality Bureau in the Prevention of Significant Deterioration (PSD) program and State Implementation Plan (SIP).

No New Road Construction Including Temporary Roads

Several comments requested an alternative that would not include the construction of any new roads. As part of the action alternatives, temporary roads would be constructed for the purpose of removing hazardous fuels from strategically located units. The interdisciplinary team assessed locations where hazardous fuels could be removed using only existing roads. In doing so, the team found that fuel removal would not be feasible

in areas adjacent to private property around the community of Rimini, Buffalo Creek, and Whiteman Gulch as well as within portions of the Upper Tennile Creek municipal watershed. The team also considered utilizing only hand methods and prescribed fire, but found that rearranging fuels by these methods alone would not meet resource objectives. Without the use of a temporary road system, treatment would not occur within these areas and would therefore limit the project from effectively modifying fuel behavior and restoring heterogeneity to the extent needed to reduce the probability of high-severity wildfires and their associated detrimental watershed effects in the Tennile Municipal Watershed and surrounding areas. Furthermore, conditions for public and firefighter safety would not be improved and a mosaic of vegetation and fuel structure more resilient to disturbance would not be created.

No Treatment in Inventoried Roadless Areas (IRA)

Several comments were received requesting an alternative that would not have treatments within Jericho Mountain and Lazyman Gulch IRAs. Under this alternative, there would be no treatments proposed within IRAs. Failure to treat strategic locations within the IRAs would not reduce the risk to important values and critical infrastructure that this project is intended to address. Furthermore, opportunities to manipulate fuels structure to improve conditions for public and firefighter safety across the landscape would be constrained across a large part of the project area. In the event of a wildfire within the IRAs, fire management staff would likely be compelled to restrict ground crew response due to safety concerns related to snags and inadequate escape routes to safety zones as a result of the continuous layers of fallen dead trees. Furthermore, the probability of successfully protecting important values and infrastructure such as the municipal watershed, public safety and property, soil and water resources would be low.

Build Water Filtration System for the City of Helena

A comment was received requesting an alternative be developed that would examine building a water treatment plant that can handle the increase in sediment caused by wildfire in Helena's watershed. As is discussed in the draft EIS and hydrology specialist report, wildfires can impact water quality in a variety of ways, many of which are difficult or expensive to handle by water treatment plants. High turbidity and sediment loads are likely concerns, though increases in other contaminants also pose problems. While construction of water treatment facilities for a municipality is outside of the Forest Service's mandates, the City of Helena spoke with specialists from the consulting firm CH2M-Hill to investigate the feasibility of adding a sediment-reducing treatment component to the Tennile Water Treatment Plant. This option was determined by the City to be unfeasible due to high construction and operational expenses.

Only Create Buffers around the IRAs and Private Property

Several comments were received requesting treatments be limited to buffers around IRAs and/or private property. As mentioned above, treatment units have been strategically located in order to effectively meet the purposes of the project to improve conditions for public and firefighter safety across the landscape in the event of a wildfire and to maintain a consistent quantity and quality of water within the municipal watershed. Limiting treatments to buffers around IRAs and/or private property would fail to address

firefighter and public safety in the event of a wildfire across a large part of the project area. Furthermore, this alternative would eliminate the majority of strategically located units at the landscape scale designed to achieve a mosaic of vegetation and fuel structure more resilient to disturbance which would provide for safer, more effective fire suppression actions.

Eliminate Units (with roads and noxious weeds present) from Fire Management Proposals

One commenter asked for an alternative to be developed “that eliminates units that have noxious weeds present on roads within units from fire management proposals.” Because weeds are generally present along almost all roads within the project area this would essentially eliminate fire management from all units in which it is proposed. Eliminating all fire treatments from the project would not meet fuels and site preparation objectives and also would not meet purpose and need objectives, as described in the “no burn” entry above.

Expand Treatments West of the Continental Divide

The area west of the Continental Divide is outside the project area. Adding treatments to the west would change the nature and scale of the project and would therefore be out of the scope of this project. However, other projects, such as the Telegraph Vegetation Project, are considering treatments west of the Divide.

No Site-Specific Amendment

Based on comments received, the Helena – Lewis and Clark National Forest considered an alternative which would not require a site-specific amendment to forest-wide or management area standards. Analysis demonstrates action alternatives as proposed would result in a quicker attainment of habitat components associated with big game standards as a result of rapid regeneration as compared to the no action alternative that could take a longer amount of time. Additionally, a large portion of the project area is mapped winter range in which the Forest Plan requires that all winter ranges be closed to vehicles between December 1 and May 15. Without amending this standard, timing of implementation would be limited to outside the December 1 to May 15 window which would limit the project’s ability to timely implement proposed activities. This would result in extending the duration it would take to achieve project goals and consequentially result in higher implementation cost especially considering that a large part of the project area is located within winter range. Also, operating mechanical equipment during the winter when the ground is frozen or covered in snow greatly reduces potential impacts to soils and the spread of noxious weeds. Prescribed burning activities during the spring (prior to May 15) would also be eliminated under a no amendment alternative. The ability to perform prescribed burning during the spring allows for extended burning window opportunities. Weather and fuel conditions during other times of the year are typically not suitable for performing prescribed burns. Also, a site-specific amendment for forestwide standard 4a would be required for both action alternatives. Analysis indicated that the Helena – Lewis and Clark National Forests does not have jurisdiction over a sufficient amount of open roads in the Quartz Creek Elk Herd Unit to influence road closures and achieve consistency with Standard 4a. To this end, a no amendment

alternative was not considered further. See the Tenmile – South Helena Wildlife Specialist report for additional information regarding site-specific Forest Plan amendment to standards.

Comparison of Alternatives

This section provides a tabular summary of the effects of implementing each alternative. The tables⁵ display Purpose and Need, Key Issues, and Resource Measurement Indicators by alternative. The action alternatives address key issues to varying degrees, dependent upon specific alternative design elements.

Table 14. Purpose and need indicators by alternative

Purpose and Need Indicators	Alternative 1 (Existing Condition)	Alternative 2	Alternative 3
Project area treated – percent and acres	0	40 / 24,308	30 / 18,112
Miles of road decommissioned	0	15	15
Number of damaged or undersized culverts replaced	0	17	17
Net acres of wetland restored in Upper Tenmile Creek drainage	0	18	17.5

Table 15. Significant issues by alternative

Issues	Alternative 1 (Existing Condition)	Alternative 2	Alternative 3
<i>Inventoried Roadless Area</i>			
Jericho Mountain IRA acres treated	0	3,944	1,462
Lazyman IRA acres treated	0	3,992	3,440
<i>Elk security and hiding cover</i>			
<i>Acres and percent of hiding cover</i>			
Black Mountain-Brooklyn Bridge Elk Herd Unit	30,608 / 56%	19,902 / 37%	22,108 / 41%
Jericho Elk Herd Unit	25,810 / 73%	18,556 / 53%	21,786 / 62%
Quartz Elk Herd Unit	20,849 / 57%	19,415 / 53%	20,061 / 55%
<i>Acres of hiding cover in security areas</i>			
Black Mountain-Brooklyn Bridge Elk Herd Unit	4,833	3,826	3,996
Jericho Elk Herd Unit	3,139	1,498	2,365
Quartz Elk Herd Unit	0	0	0
<i>Acres of hiding cover in intermittent refuge areas</i>			
Black Mountain-Brooklyn Bridge Elk Herd Unit	1,534	864	1,239
Jericho Elk Herd Unit	863	863	863

⁵ Incorporates all design features/mitigation measures

Issues	Alternative 1 (Existing Condition)	Alternative 2	Alternative 3
Quartz Elk Herd Unit	981	907	981
<i>% Hiding cover /open road density mi/m² during the hunting season by elk herd unit Post and (during Implementation)</i>			
Black Mountain-Brooklyn Bridge Elk Herd Unit	0.8	0.8 (1.14)	0.8 (1.05)
Jericho Elk Herd Unit	1.3	1.3 (1.45)	1.3 (1.47)
Quartz Elk Herd Unit	1.1	1.1 (1.21)	1.1 (1.14)
<i>Road Activity (miles)</i>			
Temporary Road Construction followed by decommissioning	0	43	24
Road maintenance	0	6	4
Road reconstruction	0	32	28
Haul routes	0	38	32
<i>Recreation</i>			
Miles of trail within treatment units	0	25	23

Table 16. Resource measurement indicators by alternative

Resource (measurement indicator)	Alternative 1 (Existing Condition)	Alternative 2	Alternative 3
Hydrology/Aquatic Organisms by 6 th – HUC drainage			
Equivalent Clearcut Acres on NFS land within project area			
Lump Gulch	4,629	5,118	4,875
Middle Prickly Pear Creek	2,459	2,494	2,459
Last Chance Gulch	1,613	1,906	1,901
Upper Tenmile Creek	3,177	4,306	4,139
Middle Tenmile Creek	2,566	2,729	2,667
Lower Tenmile Creek	1,732	1,765	1,761
<i>Sedimentation from treatment units (tons, probability of sedimentation in the first year after treatment)</i>			
Lump Gulch	N/A	0.1	0.0
Middle Prickly Pear Creek	N/A	0.0	0.0
Last Chance Gulch	N/A	0.1	0.1
Upper Tenmile Creek	N/A	0.4	0.1
Middle Tenmile Creek	N/A	0.9	0.1
Lower Tenmile Creek	N/A	0.1	0.1
<i>Sedimentation from Roads (average tons/year)</i>			
Lump Gulch	1.7	1.1	1.1
Middle Prickly Pear Creek	--	--	--
Last Chance Gulch	3.7	1.4	1.4

Resource (measurement indicator)	Alternative 1 (Existing Condition)	Alternative 2	Alternative 3
Upper Tenmile Creek	14.0	2.2	2.2
Middle Tenmile Creek	--	--	--
Lower Tenmile Creek	--	--	--
<i>Road decommissioning (miles decommissioned within 150 feet of stream)</i>			
Lump Gulch	0	0.1	0.1
Middle Prickly Pear Creek	0	0	0
Last Chance Gulch	0	0	0
Upper Tenmile Creek	0	1.8	1.8
Middle Tenmile Creek	0	0	0
Lower Tenmile Creek	0	0	0
Wetlands restored/impacted (net acres restored)			
Upper Tenmile Creek	0	17.0	16.5
Vegetation			
<i>Vegetation Types – Percent and acres of total treatments</i>			
Proposed treatments in <i>Douglas-Fir and ponderosa pine</i> dry warm vegetation types – percent / acres of total treatments	0	63 / 15,780	59 / 9,808
Proposed treatments in <i>Lodgepole pine and mixed conifer</i> cool-moist vegetation types – percent / acres of total treatments	0	37 / 8,528	31 / 5,158
Proposed Treatment in <i>Grassland</i> warm and dry vegetation types – percent / acres of total treatments	0	0	10 / 1,662
<i>Snags/ac in Third Order Drainages (post treatment)</i>			
Drainage 1001-1	100	78	78
Drainage 1001-2	195	91	172
Drainage 1001A	206	194	196
Drainage 0814	71	58	63
Drainage 0809C	35	34	35
Fuels			
Tenmile Watershed - 38,674 acres (Percent of area treated)	0	38	29
Flame length (Percent change in flame length / Feet)	Treatment Type		
	Improvement Harvest	NA / 7.3	59.7 / 2.9
	Clearcut with Leave Trees	NA / 21.4	67.2 / 4.3
	Shelterwood with Leave Trees	NA / 16.7	82.7 / 5.9
		53.4 / 3.4	78.0 / 4.7
		72.5 / 4.6	

Resource (measurement indicator)		Alternative 1 (Existing Condition)	Alternative 2	Alternative 3
	Shaded Fuel Break	NA / 4.0	34.9 / 5.4	45.0 / 2.2
	Low Severity Grassland Prescribed Fire	NA / 4.4	57.8 / 1.9	25.0 / 3.3
	Low Severity Prescribed Fire	NA / 6.6	58.1 / 2.6	60.6 / 2.6
	Mixed Severity Prescribed Fire	NA / 3.0	72.9 / 1.6	43.3 / 1.7
	Private Land Buffers	NA / 10.9	66.1 / 3.8	66.1 / 3.7
	Precommercial Thin	NA / 15.8	78.1 / 3.3	76.6 / 3.7
Percent change in fireline intensity / fireline intensity (BTU/FT/S)	Treatment Type			
	Improvement Harvest	NA / 501.5	75.7 / 120.1	69.5 / 153.0
	Clearcut with Leave Trees	NA / 1892.8	81.1 / 175.1	88.1 / 225.2
	Shelterwood with Leave Trees	NA / 1333.4	89.1 / 322.1	85.4 / 194.7
	Shaded Fuel Break	NA / 187.4	56.0 / 247.4	66.2 / 63.4
	Low Severity Grassland Prescribed Fire	NA / 194.8	82.9 / 39.0	43.4 / 110.3
	Low Severity Prescribed Fire	NA / 447.4	79.7 / 79.5	79.9 / 90.1
	Mixed Severity Prescribed Fire	NA / 118.6	94.8 / 17.9	82.6 / 20.6
	Private Land Buffers	NA / 851.3	71.4 / 253.9	71.2 / 245.0
	Precommercial Thin	NA / 1275.2	87.1 / 156.4	84.0 / 203.5
Noxious Weeds				
<i>Predicted increase in acres of potential noxious weed infestations resulting from proposed activities.</i>		0	3,494	2,564
Wildlife ⁶				

⁶ Also includes elk significant issue measurement indicators

Resource (measurement indicator)	Alternative 1 (Existing Condition)	Alternative 2	Alternative 3
<i>Elk</i>			
<i>Elk habitat effectiveness on summer range (Post and During Implementation)</i>			
Black Mountain-Brooklyn Bridge Elk Herd Unit	65/NA	65/56	65/58
Jericho Elk Herd Unit	56/NA	56/52	56/51
Quartz Elk Herd Unit	58/NA	58/53	58/56
<i>% Hunting season elk security by elk herd unit post and during project implementation</i>			
Black Mountain-Brooklyn Bridge Elk Herd Unit	16/NA	16/13	16/15
Jericho Elk Herd Unit	12/NA	12/12	12/12
Quartz Elk Herd Unit	0/NA	0/0	0/0
<i>% Hunting season intermittent refuge areas by elk herd unit post and during project implementation</i>			
Black Mountain-Brooklyn Bridge Elk Herd Unit	5/NA	5/3	5/5
Jericho Elk Herd Unit	3/NA	3/3	3/3
Quartz Elk Herd Unit	5/NA	5/3	5/5
<i>% Elk thermal cover by elk herd unit on winter range</i>			
Black Mountain-Brooklyn Bridge Elk Herd Unit	17	13	15
Jericho Elk Herd Unit	25	8	9
Quartz Elk Herd Unit	16	13	13
<i>Lynx</i>			
<i>% Lynx Analysis Unit (LAU) in early stand initiation habitat</i>			
LAU di-04	3	3	3
LAU di-05	3	14	11
LAU di-06	1	4	2
<i>% Lynx Analysis Unit (LAU) in stand initiation hare habitat</i>			
LAU di-04	10	10	10
LAU di-05	2	1	1
LAU di-06	6	6	6
<i>% Lynx Analysis Unit (LAU) in multistory hare habitat</i>			
LAU di-04	32	32	32
LAU di-05	26	22	23
LAU di-06	37	36	37
<i>Other Wildlife Species</i>			
Acres of potential Northern Goshawk habitat (Nesting) in the project area	24,313	19,894	21,541
Acres of improved large ponderosa stands (improved flammulated owl habitat)	0	2,726	2,211

CHAPTER 3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

Introduction

This section presents the biological, physical and socioeconomic environments of the affected project area and the potential changes to those environments due to implementation of the alternatives. It also presents the scientific and analytical basis for comparing the alternatives as described in Chapter 2.

This chapter is arranged by resource area, starting with an overall introduction to vegetation to provide the reader a better understanding of the overall vegetative condition. Following each resource description is a discussion of the potential effects (environmental consequences) to the resources associated with the implementation of each alternative. Potential effects, including direct, indirect, and cumulative effects are disclosed. Effects are quantified, where possible, and qualitative discussions are also included. Acre totals are approximate within tables and text due to rounding.

This analysis uses best available science, but recognizes that opposing science exists. A literature review of opposing science sent to the project by the public in scoping responses was reviewed and where appropriate, incorporated information within literature into analysis, issue statements and the development of alternatives.

This DEIS incorporates by reference the resource specialist reports in the project record (40 CFR 1502.21). Specialist reports contain detailed data, executive summaries, regulatory framework, assumptions and methodologies, analyses, conclusions, maps, references, and technical documentation that the resource specialists relied upon to reach conclusions in the DEIS. This chapter presents the relevant resource components of the existing environment – the base line environment. It describes the resources of the area that would be affected by the alternatives. This chapter also discloses the environmental effects of implementing the alternatives. These form the scientific and analytical basis for comparing the alternatives described in chapter 2. All resource professionals have integrated the design features and mitigation measures described in chapter two into their analyses and conclusions.

This DEIS incorporates the Forest Plan by reference and tiers to the FEIS completed for the Forest Plan, and amendments. This DEIS also tiers the BLM Butte Field Office Resource Management Plan (RMP) Record of Decision. The discussions of resources and potential effects take advantage of existing information included in the Forest Plan, the BLM Butte Field Office RMP and other sources as indicated. Where applicable, such information is briefly summarized and referenced to minimize duplication. The planning record includes all project-specific information such as resource reports, ecosystem analyses, and other results of field investigations. The record also contains information resulting from public involvement efforts. The planning record is available for review by contacting the Helena National Forest office.

Analyzing Environmental Consequences

Environmental consequences are the effects of implementing an alternative on the biological, physical, economic, and social environment. The Council of Environmental Quality regulations implementing the National Environmental Policy Act include a number of specific categories to use for the analysis of environmental consequences. Several form the basis of much of the analysis that follows. They are explained briefly here.

Direct, Indirect, and Cumulative Effects

Direct environmental effects are those occurring at the same time and place as the initial cause or action. Indirect effects are those that occur later in time or are spatially removed from the activity, but would occur in the foreseeable future. The project is expected to be active over approximately the next 10 to 15 years, or from the time the decision is made to full implementation. Cumulative effects result when the incremental effects of actions are added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such actions. Cumulative effects can result from individually minor, but collectively significant, actions taking place over a period of time. Past activities contributed to the existing condition and are considered in the affected environment. Present and reasonably foreseeable future actions are assessed along with the effects of the proposed action to determine whether significant cumulative effects may occur.

In order to understand the contribution of past actions to the cumulative effects of the proposed action and alternatives, this analysis considers the current environmental conditions as a reflection of the aggregate impact of all prior human actions and natural events that affected the environment and might contribute to cumulative effects.

The cumulative effects analysis does not attempt to quantify the effects of past human actions by adding up all prior actions on an action-by-action basis. There are several reasons for not taking this approach. First, a catalog and analysis of all past actions would be impractical to compile and unduly costly to obtain. Current conditions have been impacted by innumerable actions over the last century, and trying to isolate the individual actions that continue to have residual impacts would be nearly impossible. Second, providing the details of past actions on an individual basis would not be useful to predict the cumulative effects of the proposed action or alternatives. In fact, focusing on individual actions would be less accurate than looking at existing conditions, because there is limited information on the environmental impacts of individual past actions, and one cannot reasonably identify each and every action over the last century that has contributed to current conditions. Additionally, we cannot focus on the impacts of past human actions and ignore the important residual effects of past natural events, which may contribute to cumulative effects just as much as human actions. By looking at current conditions, we are sure to capture all the residual effects of past human actions and natural events, regardless of which particular action or event contributed those effects. Furthermore, the Council on Environmental Quality issued an interpretive memorandum on June 24, 2005 regarding analysis of past actions, which states, “agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions.” The

cumulative effects analysis in this EIS is also consistent with Forest Service National Environmental Policy Act (NEPA) Regulations (36 CFR 220.4(f)) (July 24, 2008). This EIS is also consistent with the Council on Environmental Quality memo from James L. Connaughton titled “Guidance on the Consideration of Past Actions in Cumulative Effects Analysis” dated June 24, 2005, incorporated by reference.

The Helena National Forest Schedule of Proposed Actions (SOPA) was reviewed and forest and district personnel consulted to identify current and reasonably foreseeable projects on the Helena Ranger District. Contacts were made with adjacent Forests for proposed activities to be considered for affected resources cumulative effects analysis.

Assessment areas vary by resource, and so do the other actions included in each cumulative effects analysis. Cumulative effects may include estimated effects from present logging (timber harvest, fuels treatments, road and landing construction and maintenance) and wildfire activities (e.g. suppression activities and the affected burn areas). Other actions may include but are not limited to grazing, mining and fuels reduction and/or forest health projects in the vicinity.

Ongoing activities include annual road maintenance, firewood gathering, recreation trail use for hiking and snowmobiling, dispersed camping, hunting, and appropriate responses for fire suppression. The past, present and reasonably foreseeable actions considered for this project analysis are displayed in appendix C to this DEIS.

Forested Vegetation

Introduction

This Forest Vegetation Report provides analysis of the existing condition of the major vegetation types within the project area and the effects of the proposed action on those major vegetation types. A discussion of dominant disturbance processes provides the characterization of change that has occurred over time to the vegetation types. This provides the basis for the analysis.

The western half of the project area, the Tenmile Watershed (29,692 acres), is characterized by productive lodgepole pine growing on Douglas-fir and subalpine fir habitat types that were initiated by wildfire prior to 1900. Over the last century the homogeneity of the forest has not been substantially fragmented by modern timber harvest or wildfire. With the exception of limited areas, the landscape became characterized by densely growing mature lodgepole pine trees. As a result, the mountain pine beetle (MPB) outbreak caused extensive mortality peaking in 2009, affecting all mature lodgepole pine stands with intensities greater than 90 percent mortality in some stands. There are also stands mixed with Douglas-fir, subalpine fir, and Engelmann spruce, and limited areas dominated by these species as well as natural meadows.

The eastern half of the project area, the South Helena Landscape (24,745 acres), contains a lesser amount of lodgepole pine compared to the Tenmile Watershed, and is principally characterized by dry Douglas-fir and ponderosa pine forests intermixed with grasslands. More extensive modern management has occurred in this area, including logging, hand treatments, and prescribed burning. These drier vegetation types historically would have

burned with relatively high frequency. The lack of natural fire in this landscape has resulted in a buildup of surface fuels, ladder fuels (small trees) and conversion of seral types such as ponderosa pine to more shade tolerant species such as Douglas-fir. The MPB outbreak caused mortality to the majority of mature ponderosa pine, adding additional fuel loading to these dry forests. Due to its proximity to the City of Helena, this portion of the landscape has been subject to more recent treatments focused on hazardous fuel reduction, though these treatments occurred prior to the MPB epidemic.

The relevant issue to this analysis is the changes that have occurred to forest vegetation as a result of the mortality caused by the mountain pine beetle epidemic. Every pine stand that is larger than 5 inches in diameter has been affected by the mountain pine beetle epidemic in the project area (an estimated 23,541 acres of lodgepole pine and ponderosa pine with dead or dying trees over the majority of the stand).

This change in the composition of live and dead trees has resulted in a change in the forest fuel profile, which will be explored in more detail with the Fuels Report. However, this change in the fuel profile also affects the current and future stand dynamics of the forest, and will be analyzed.

Tree mortality within the project area has a direct affect to key habitat features and important tree species components that represent habitat. Early-seral, mid-seral, and late-seral stand conditions along with tree species diversity that results in forest- and stand-heterogeneity, forest- and stand- resiliency, old growth and snags will be analyzed; the habitat components that are represented by these species are discussed in the Wildlife Report.

The spatial vegetation analysis area is the project area, and encompasses 61,395 acres (Forest Service ownership, 49,546 acres; BLM ownership, 1,043; private ownership, 7,512 acres; other ownership, 799 acres – includes 138 acres of City of Helena ownership). The analysis area includes all proposed activities on Forest Service and Bureau of Land Management (BLM) Lands. The temporal timeframe covers the span of time in which the effects of the proposed actions were analyzed. This period takes into account the cumulative effects of all actions up to the present, and extends into the future for 50 years.

Assumptions

Forested vegetation is dynamic and analysis requires assumptions. Climate change presents an aspect of uncertainty in future conditions, disturbance regimes, and vegetative responses. This analysis assumes that tree species evolved with different fire frequencies, and that fire suppression has disrupted natural fire frequencies. Relationships between climate, natural disturbances such as fire and insects, and human activities such as fire suppression are synergistic and complex forces that impact vegetation structure and condition. It is assumed that fire suppression policies will continue in the area.

A variety of well-researched, documented, and accepted analysis tools are used, including statistically valid sampling (FIA plots, common stand exams) and the Forest Vegetation Simulator model (FVS).

Based on yearly aerial detection surveys (ADS), it is assumed the mountain pine beetle has primarily run its course in the Project Area; substantial additional mortality is not anticipated although localized beetle populations may still be active.

The analysis of the major vegetation type conditions that comprise the project area will center on a discussion of dominant disturbance processes. This provides the characterization of change that has occurred over time to the forest vegetation types and with this basis offers the context for analyzing the effects of the alternatives and future trends for no action and action over a 50 year period.

The MPB outbreak caused extensive mortality in mature pine-dominated stands peaking in 2009, affecting over 45 percent of the forest vegetation types with the majority of those stands now comprised of dead pine trees. However, the impact of the MBP outbreak is in virtually all conifer stands within the project area, as pine species occur within all forested areas at all elevations within the project area. Homogeneity in this watershed has shifted from one dominated by mature trees to one dominated by heavy fuel loading and seedling re-initiation, with a smaller percentage of scattered mature trees. This change in the composition of live and dead trees has resulted in a change in the forest fuel profile, affecting the current and future stand dynamics of the forest within the project area.

The eastern half of the project area is principally characterized by dry Douglas-fir and ponderosa pine forests intermixed with grasslands. These drier vegetation types historically would have burned with relatively high frequency. The lack of natural fire in this landscape has resulted in a buildup of surface fuels, ladder fuels (small understory trees) and conversion of seral types such as ponderosa pine to more shade tolerant species such as Douglas-fir. The MPB outbreak caused extensive mortality to the mature ponderosa pine and lodgepole pine component of this area, creating additional fuel loading to the existing fuel profile.

The extensive mortality to mature pine trees throughout the project area is neither an improvement nor considered an unraveling of the forest ecosystem, rather the changed condition presents issues around stand productivity and long-term management as well as an elevated fire risk to all local communities in or adjacent to the project area with the dramatic increase in fuel loading. In particular, the proximity of the dry-forest – fuel-loaded -complex in the eastern half of the project area (South Helena area) presents a fire suppression hazard with elevated fire risk to more densely populated communities.

The existing forest vegetation condition of the project area represents a significant departure from Forest Plan objectives and goals.

Information Used

A variety of well-researched, documented, and accepted analysis tools are used. The following section describes databases and models that are used to describe the vegetation resource. More detailed protocols, limitations, and assumptions are documented in the Project File.

Region 1 Existing Vegetation Map Product (R1-Vmap) is a vegetation map product produced by the Northern Region Geospatial group (USDA 2011a; USDA 2009a). This

is a satellite imagery based map that includes all the land on the HLCNF, plus a one-mile buffer surrounding the administrative boundary. The information is grouped into vegetation that is alike and organized by polygon-based map units. A polygon is an area fully encompassed by a series of connected lines. Each polygon has a life form, canopy cover, vegetation type, and size class (where tree canopy cover occupies at least 10%). Additional information is attached to each polygon, using a digital elevation model, which includes the majority elevation, slope, and aspect. R1-Vmap attributes have been validated through a process outlined in the documentation for The Region 1 Existing Vegetation Map Products Release 9.1.1 (USDA 2009a) and the accuracy of the various data items has been assessed as described in R1-Vmap Accuracy Assessment Procedures for Region 1 (USDA 2009b). An accuracy assessment for the VMap product specific to the Eastside Forests, including the HLCNF, was conducted in 2010 (USDA 2010a). It is also important to ensure the map product meets minimum accuracy standards when used at smaller scales for project analysis. Therefore, an accuracy assessment of VMap was performed for the combination boundary area to determine its statistical reliability for use at the project scale, the results of which are available in the project file (USDA 2013). The product exceeds the national standard for geospatial accuracy for all attributes.

Aerial Detection Surveys (ADS) are maps of visible insect and disease presence generated annually in the Northern Region based on visual observations taken during survey flights. Surveys include estimates of trees and acres affected, and the data is published by Forest Health and Protection. Trees infested by bark beetles often retain a green crown for a full season after being attacked; ADS therefore reflect the previous year's beetle infestation by detecting the changing tree colors. The Tennmile – South Helena project area has been flown every year from 2006 to 2013. The aerial survey standards and GIS mapping handbook for this data are in the project file (USDA 1999; USDA 2003).

Inventory Data

Data collection procedures described here are statistically based plot measurements. The Forest Service has established quality control measures to assure established error tolerances are met.

Forest Inventory Analysis Inventory

Forest Inventory and Analysis (FIA) is a dataset made up of hierarchical points established to a nationwide systematic grid. These plots record the canopy cover of the dominant vegetation species: tree heights, diameters, habitat type, age, physical defects, insect and disease activity, ground cover, and fuel loading. Information is recorded for understory species and ground cover as well. FIA points provide a grid based, statistically reliable inventory dataset across the Forest using national data collection protocols. The HLCNF has added points that intensify the base grid, by placing four times the number of points across the Forest, using collection protocols established for the Northern Region compatible with the national protocols as defined in Region 1 Grid Intensification Using CSE protocols Field Procedure (USDA 2008) and Common Stand Exam Field Guide for Region 1 (USDA 2012b). This dataset is referred to as "intensified grid data." The four times intensification plots are appropriately used to describe various habitats for Forest-wide, mountain range or watershed-level analyses. Due to the MPB

epidemic, tree data on grid intensification plots were re-read to determine mortality levels.

FSVeg (Field Sampled Vegetation) and Stand Examinations

FSVeg is a warehouse for data that is recorded using standard data collection protocols. Data housed in FSVeg includes FIA intensified grid data, described above, and stand examination data. Stand examinations are statistical plot surveys taken at the stand-level, measuring stand characteristics such as species, heights, diameters, physical defects and insect and disease activity of trees. Stand examinations are used at the stand level only. They are taken according to R1 CSE protocols (USDA 2012b) and provide statistically reliable estimates within a stand. Stand exam data does not exist for every stand, but are used to determine old growth conditions where available. Stand examinations were purposively sampled and are not available for all treated areas; therefore they cannot be statistically extrapolated to represent any area other than the stand in which the data was collected. Most stand exams available in the analysis areas were taken in the 1980s and 1990s; the FVS model (described below) is used to “grow” these stands into the future. In addition, several new stand exams were collected in 2014 with the primary purpose of assessing whether old growth conditions are present.

R1 Old Growth Report Utility

This utility in FSVeg produces the Region 1 FSVeg Old Growth Report based on the Region’s old growth definition and minimum criteria found in Green et al (1992). Details regarding this Utility are documented in the project record (USDA 2010b). Associated characteristics such as vertical structure, snags, live trees with broken tops, downed logs, and live trees with decay are also considered. The utility includes a future condition determination in which 10-year increments are added to the age of the trees to predict when the stand might become old growth. No mortality is modeled. The utility is run on stand examinations to assist in the spatial designation of old growth stands in third order drainages. It is also run on FIA intensification data to derive non-spatial but statistically reliable estimates of old growth abundance at larger scales.

R1 Summary Database

The R1 Summary Database is a data analysis system used to analyze intensified grid data. This database is provided by the Northern Region of the Forest Service Inventory and Analysis Team (USDA 2006a). The database is used to make various vegetation condition estimates. FSVeg individual tree data is summarized as plot level data in FVS, and is used as the base data in the Summary Database. This database reflects the most current data available and was used to derive estimates of snags and old growth. Specific wildlife habitat amounts were also derived from this database. Statistical estimates were derived for all summarized conditions. In addition, the Summary Database contains site-specific and analysis-specific data.

Forest Vegetation Simulator (FVS)

The Forest Vegetation Simulator (FVS) is an individual-tree, distance-independent growth and yield model that predicts forest stand dynamics. FVS is used extensively by government agencies, industry, educational institutions, and private landowners. Forest

managers have used FVS to summarize current stand conditions, predict future stand conditions under various management alternatives, and update inventory statistics.

Several proposed treatment units were chosen to display representative effects. In this context, FVS provides estimates used to compare trends. Qualitative discussions accompany data to ensure analysis reflects current and predicted conditions. FVS is used to model current and future forest structure conditions for each alternative in the example units. Detailed documentation, assumptions, and all data generated from FVS are available in the project record. There are limits to what FVS can accurately predict due to the wide range of factors that influence stand development over time (USDA 2002a).

Forest Activity Tracking System (FACTS)

The Forest Service ACTivity Tracking System (FACTS) is an activity tracking system for all levels of the Forest Service. It supports timber sales in conjunction with TIM Contracts and Permits; tracks and monitors NEPA decisions; tracks KV trust fund plans at the timber sale level, reporting at the National level; and, it generates National, Regional, Forest, and/or District Reports. FACTS is the current activity database in which all management and natural events are recorded. Records in this database date back generally to the 1950s.

Silvicultural Diagnoses and Field Visits

Detailed field diagnoses (walk-through surveys) were done by silviculture personnel. The documentation package includes a summary of vegetation structure and conditions, insect activity, evidence of past activity, snag conditions, an old-growth assessment, and photographs. Additionally, field visits have been made by all of the resource specialists involved in this project.

Literature

The best available science was reviewed, including citations provided from public input. Peer reviewed documents were selected when possible.

Methodology

Methodology and Scientific Accuracy

This analysis is based on the best available science and acknowledges that there is incomplete and unavailable information. Scientific uncertainty, incomplete information, and controversy among experts are inescapable facets of the scientific process (Clarke 2006). Uncertainty arises from factors such as complexity, natural variability, random variation, measurement error, and lack of knowledge (Clarke 2006). Elements of uncertainty are considered qualitatively. Policy measures designed to deal with uncertainty include public participation, interdisciplinary processes, and monitoring (ibid).

There are a series of tables that display numbers of acres and percentages. All raw numbers and calculations can be found in the Project file. The values shown are rounded.

In some cases due to rounding the total is slightly less or more than the actual total; in these cases, an acre or percentage was added to or subtracted from the largest value.

Vegetation Structure and Composition Methodology

Descriptions of existing vegetation are derived by summarizing available data, primarily VMap, using GIS tools and pivot tables. Additionally, the R1 Summary Database is used to summarize FIA grid intensification data. Fine scale information is derived from stand examinations where available and site visits.

Existing Vegetation Methodology

One basic forested vegetation description used is forest type, which is simply the tree species that currently dominates. Dominance can be determined from aerial photography, satellite imagery, data collection, or field visits. Using more refined definitions specified by FIA, R1 VMap, and the R1 Summary Database protocols (USDA 2011a); dominance type or group similarly denotes the dominant species based on the percent cover of species or groups of species in a polygon. There is a tie between existing vegetation and potential vegetation, but the current dominant species may not be the same as the potential dominant species. For example, a ponderosa pine forest or dominance type often grows on a Douglas-fir habitat type and is perpetuated by frequent disturbance. In these areas, if disturbance does not occur, eventually the forest type would shift to Douglas-fir through succession.

It is also useful to describe the structure of the existing vegetation. At the broad to mid-scale, the HLCNF uses VMap to describe two elements of forest structure: canopy cover and tree size class which are somewhat similar to the vegetation classes described for biophysical settings. The density of tree stems is depicted by canopy cover, which is a measure of the coverage of tree crowns in a stand as a percentage of the land area. VMap displays four classes of canopy cover. The second structural element is tree size, which is a measure of the tree trunk diameters. VMap also displays four classes of tree size, which can be generally correlated to age classes or stand developmental stages.

Forested Vegetation, Affected Environment

Introduction

Desired Future Condition, Indicators, & Measures

The desired future condition (DFC) of forested vegetation is a diverse mosaic of patch and pattern that provides the ecosystem services required from this landscape. The elements of this DFC are displayed in the figure below. Some of these elements are addressed in other resource reports, as noted. To analyze how each Alternative moves the landscape toward the desired condition, indicators and measures are used. These are displayed for the short term (within 5 years) and where applicable, long-term (50 years). Because forests are long-lived, additional effects after 50 years may be discussed qualitatively as well.

- In the short term, the Desired Future Condition is a mosaic landscape that trends toward:
 - Stands killed by MPB have diverse and robust reforestation.
 - Age class diversity enhanced to provide opportunity for future diversification.
 - Diversity in species and density on a mosaic to enhance resilience.
- The long term Desired Future Condition is resiliency to future disturbance regimes, including climate change.
 - The forested mosaic is diverse in size-type-age so that disturbances are appropriately constrained in space and time.

Figure 20. Forested vegetation desired future condition elements.

The indicators for this vegetation analysis, with their associated measures are:

Table 17. Forest vegetation indicators and units of measure.

Resource Indicators	Qualitative Unit of Measure	Quantitative Unit of Measure
MPB-impacted forest regenerated	None	Measured by acres of regenerated forest
Resilience within forested stands	None	Measured by acres of age class diversity Measured by acres of species diversity And measured by acres of stand density diversity
Landscape heterogeneity	Measured by a qualitative discussion of landscape-level resiliency with patch-mosaic differences between the alternatives	None

Analysis Area Spatial and Temporal Boundaries

The spatial vegetation analysis area is the project area, and encompasses 61,395 acres (Forest Service ownership, 49,546 acres; BLM ownership, 1,043; private ownership, 10,007 acres; other ownership, 799 acres – includes 138 acres of City of Helena ownership). The analysis area includes all proposed activities. The temporal timeframe covers the span of time in which the effects of the proposed actions were analyzed. This period takes into account the cumulative effects of all actions up to the present, and extends into the future for 50 years.

Landscape Level Processes

Composition and configuration of vegetation in the Tenmile – South Helena project area prior to European settlement was shaped by natural disturbances and processes and to a lesser extent, Native American land management. Natural disturbances and processes that influenced and would continue to influence vegetation in this area include climate variability, watershed processes (i.e. flooding, mass wasting, debris flows, avalanches), fire events, and insect population dynamics. Native American land management was characterized by fire ignitions for travel corridors, forage improvement, game habitat improvement, and maintenance of native plant food sources. More recently, vegetation after European settlement has been shaped by Forest Service management practices, such as timber sale activity, domestic grazing and fire suppression. Forest conditions and structures exist because of the physical site they occupy and disturbances to which they

are exposed. Broad-scale processes interact with each other in time and space to impact vegetation conditions.

Heterogeneity is the quality of consisting of dissimilar elements, as with mixed habitats or cover types occurring on a landscape (Turner et al 2001). Heterogeneity on forest landscapes may occur as mosaics of patches generated by many events, but also may be created by single large events that occur infrequently (Kashian et al 2005). Resiliency refers to the capacity of a system to tolerate disturbance without shifting to a qualitatively different state that is controlled by a different set of processes (Turner et al 2012). Sustainability refers to the use of the environment and resources to meet current needs without compromising the ability of a system to provide for future generations (Turner et al 2012). Because landscapes are dynamic and unique there is no optimal landscape mosaic that will increase all ecosystem services; however land managers can intervene in some drivers to sustain ecosystems services (Turner et al 2012). The appropriate level of heterogeneity for a landscape varies, but generally a resilient forested landscape is made up of a mosaic of age classes, composition, and succession stages because variability ensures that not all areas are equally susceptible to the same disturbances at the same time. As an example, mountain pine beetle (MPB) has recently played a dramatic role in altering conditions of vegetation in part due to widespread homogeneity of susceptible similar-aged mature pine-dominated stands.

Succession

Succession is the progression of change in the composition, structure, and processes of a plant community through time (Winthers et al. 2005). Change occurs constantly in a natural ecosystem—sometimes in small ways, such as the death of an individual tree, or in large ways through wildfire, insects, disease, or management. Succession occurs constantly in most vegetation types. Immediately following severe disturbance, the forest is classified in the early seral stage, or stand initiation. This stage is often dominated by shade-intolerant, fast-growing trees which establish quickly (Tappeiner II et al. 2007). In the absence of disturbance, the forest progresses through mid- seral stages (stem exclusion) and then into stand re-initiation in which shade-tolerant species establish under the canopy. Eventually, without disturbance the ecosystem moves into late seral stages (climax) in which shade-intolerant species may become excluded. Frequent natural disturbance may prevent a site from ever reaching a climax state. Many structural processes occur during the successional development of forest stands, including establishment, canopy closure, competitive exclusion, lower tree canopy loss, biomass accumulation, density-dependent tree mortality, density-independent tree mortality, canopy gap initiation and expansion, generation of coarse woody debris, understory re-development, establishment of shade-tolerant trees, maturation of pioneer tree cohort, canopy elaboration, development of tree decadence, and pioneer cohort loss (Franklin et al 2002).

Forest Carbon Cycling and Storage

As a major disturbance on the landscape, the mountain pine beetle (*Dendroctonus ponderosae*) epidemic and associated large-scale pine-species (lodgepole pine, ponderosa pine, and whitebark pine) mortality is affecting forest carbon storage. Every pine stand that is larger than 5 inches in diameter has been affected by the mountain pine beetle

epidemic in the project area (an estimated 23,541 acres of lodgepole pine and ponderosa pine with dead or dying trees over the majority of the stand). The impact of the MBP outbreak is in virtually all conifer stands within the project area, as pine species occurrence is within all forested areas at all elevations within the project area. In these areas, forest stands have shifted from a carbon sink to a source with dead trees releasing carbon to the atmosphere as they decompose. Over time these areas may shift back into a sink stage in their carbon cycle when carbon uptake by new tree regeneration exceeds the emissions from decomposing dead organic material. Total forest ecosystem carbon stored in the Northern Region of the Forest Service has steadily increased from 1990 to 2014, although carbon stocks on the HLCNF have decreased (USDA 2015).

Net ecosystem productivity (NEP) is a direct measure of the degree to which an ecosystem is a source ($NEP < 0$) of, or a sink ($NEP > 0$) for atmospheric carbon over the time period of interest (Brown et al. 2010). NEP is negative (or decreased) when carbon lost through decomposition exceeds that gained through photosynthesis. The mountain pine beetle epidemic has affected the NEP in these stands in several ways. First, stand photosynthesis has been dramatically reduced with the increasing severity of attack due to the death of canopy trees. This is accompanied by a corresponding decrease in stand respiration, i.e. release of carbon dioxide. The decline in photosynthesis could be reduced by increased growth of tree seedlings, saplings, trees that survive the beetle attack, shrubs, grasses, and forbs (Brown et al. 2010). A substantial increase in carbon release would be expected once dead standing trees begin to fall and decompose in the next 5-15 years from when the trees are killed, which for most pine trees in the project area was 2009; these fall rates of pine trees are predicted by Mitchell and Preisler (1998).

Because mountain pine beetles kill larger pine trees (lodgepole, ponderosa and whitebark) preferentially, these killed trees represented proportionally larger values of carbon stocks (or sequestration) and above-ground tree carbon production in killed trees within stands. More and larger trees killed results in greater decreases in carbon sequestration. Stand-level carbon can be recovered to pre-outbreak values in 25 years or less; it takes 50-160 years to recover to carbon storage values from simulations where stands were not attacked. The size distribution of surviving trees can shorten this timeframe; a greater number of smaller trees store carbon at a greater rate through an amplified growth rate when compared to larger survivors, having a greater capacity to take advantage of increased resource availability (Pfeifer et al. 2010). Successful tree regeneration is a much more critical factor in recovering carbon than stand age class distribution or tree density. As long as post-disturbance lodgepole pine stands support enough trees to have the structural characteristics of forests rather than shrublands, grasslands, or other kinds of non-forest vegetation, they would recover pre-disturbance carbon stocks quickly and the landscape would be resistant to long-term changes in carbon storage (Ryan et al. 2008).

Pregitzer and Euskirchen (2004) synthesized results from 120 separate studies of carbon pools and carbon fluxes for boreal, temperate, and tropical biomes. They found that forest age is a highly significant source of variability in NEP at the biome scale. In temperate forests such as those in the project area, the mean NEP was negative (a carbon source), but also the most variable in young stands (0-10 years). Mean NEP is positive

and is highest (a carbon sink) in stands 11-30 years old, declining thereafter as stands age, but still remaining positive.

These studies also reveal a general pattern of total carbon sequestration declining after disturbance, increasing rapidly during intermediate years, and then declining over time until another significant disturbance (timber harvest or tree mortality resulting from drought, fire, insects, disease, or other natural disturbances) kills large numbers of trees and again converts the stands to a carbon source. In this situation, carbon emissions from the decay of dead biomass exceed the amount of carbon removed from the atmosphere by photosynthesis within the stand. Over the long-term (centuries) net carbon storage is often zero if stands regenerate after disturbance because re-growth of trees recovers the carbon lost in the disturbance and in decomposition of trees killed by the disturbance (Kashian et al. 2006).

Recent scientific literature confirms some general patterns of forest carbon storage and release over the period of forest stand development and natural or induced disturbances. For large-scale context, our nations' forests have and continue to sequester vast amounts of carbon, equivalent to approximately 10 percent of annual U.S. carbon dioxide emissions from burning fossil fuels, with some estimates are as high as 19 percent (Heath and Smith 2004; Birdsey et al. 2006; Ryan et al. 2010; McKinley et al. 2011). Nationally, forests are a net carbon sink, sequestering far more carbon than they release.

Fluctuations in temperature and precipitation that characterized historic climate likely influenced vegetation distribution and patch size in the Tennmile – South Helena project area by affecting other processes such as germination and establishment of native species, fire regimes, insect activity, erosion, and stream morphology. Despite the uncertainty of future climate conditions at local scales, the majority of published science suggests that climate changes may strongly influence the frequency, intensity, and size of disturbances (such as fire and extensive insect outbreaks) in coming decades on areas of the Helena National Forest. These disturbances have important consequences for community protection, timber water yield, carbon storage, timber production, invasive species, and public perception of forest management. Changes in disturbance prompted by climate change are likely as important as incremental changes in temperature and precipitation for affecting ecosystem productivity and species composition.

Insects

Mountain pine beetle (MPB) has been the most active insect on the HLCNF in recent years. The MPB outbreak reached the peak of its acreage extent in 2009 and has been subsiding since. On the HLCNF, MPB infestation peaked at 585,557 acres in 2009 (Gibson 2009), covering over 60 percent of the administrative land base. While most of the trees killed were lodgepole pine, ponderosa and whitebark pine were also affected.

The progression of the outbreak is easily visualized by utilizing yearly Aerial Detection Surveys. Each year, some portions of the Forest are not flown. Additionally, each year active infestation polygons are mapped and may overlap with previous years; therefore the acres mapped are not necessarily cumulative. Finally, on a given polygon only the “primary” insect map is included in data summaries; therefore, when MPB is mapped and

summarized, other pests such as western spruce budworm that may also be present on that polygon are not shown.

MPB infested acres are currently below 2006 levels, when the epidemic on the HLCNF began. However, active MPB pockets are present where living hosts remain. The other two insects of interest on the HLCNF are western spruce budworm (WSB; *Choristoneura occidentalis*) and Douglas-fir beetle (DFB; *Dendroctonus pseudotsugae*). WSB remains active, with population fluctuations year to year. This prolonged outbreak may be a consequence of warm weather and multi-layering in Douglas-fir forests. Despite a brief population build after the wildfires of 2000, DFB populations remain low, but hazard exists due to tree density, drought, and WSB defoliation.

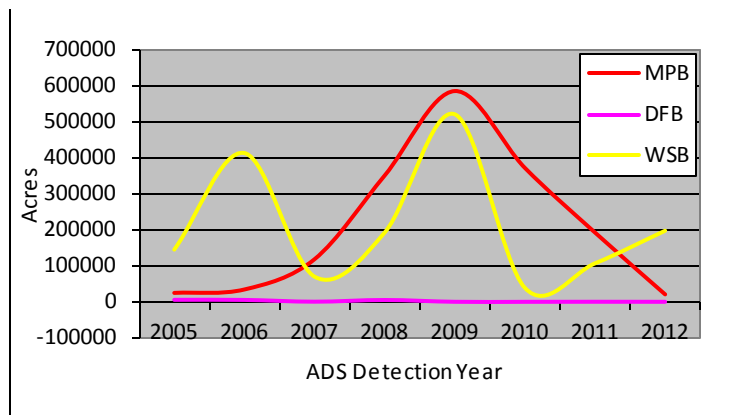


Figure 21. Forest-wide insect infestation – acres (Aerial Detection Surveys 2005-2012)

The outbreak began roughly in 2006, peaking in 2008 and 2009; see map below that displays MPB extent in 2009 across the combination boundary and Tenmile – South Helena project area. The outbreak has now subsided, largely due to host depletion. The beetle was able to successfully infest and sweep through the project area due to the preponderance of mature, dense lodgepole pine dominated mid- to upper elevation forests and larger diameter ponderosa pine in lower elevation dry forests. This insect has progressed out of the outbreak phase in general, and will remain on the landscape in endemic quantities. MPB is not expected to rise to outbreak populations again until the forest grows and in time the landscape contains susceptible mature pine forests again. This landscape was one of the most impacted landscapes on the HLCNF due to the quantity of susceptible forests available to the MPB. Every pine stand that is larger than 5 inches in diameter has been affected by the MPB epidemic in the project area (an estimated 23,541 acres of lodgepole pine and ponderosa pine with dead or dying trees over the majority of the stand).

Table 18. Aerial disease survey data within the project area, years 2005 through 2011

Mountain	2005	2006	2007	2008	2009	2010	2011
Pine	Acres	Acres	Acres	Acres	Acres	Acres	Acres
Beetle	2717	19185	23736	39998	59406	41434	29082
Affected	Total Trees	Total Trees	Total Trees	Total Trees	Total Trees	Total Trees	Total Trees
Acres & Trees	612	2541	56567	3748128	3513716	430804	208154

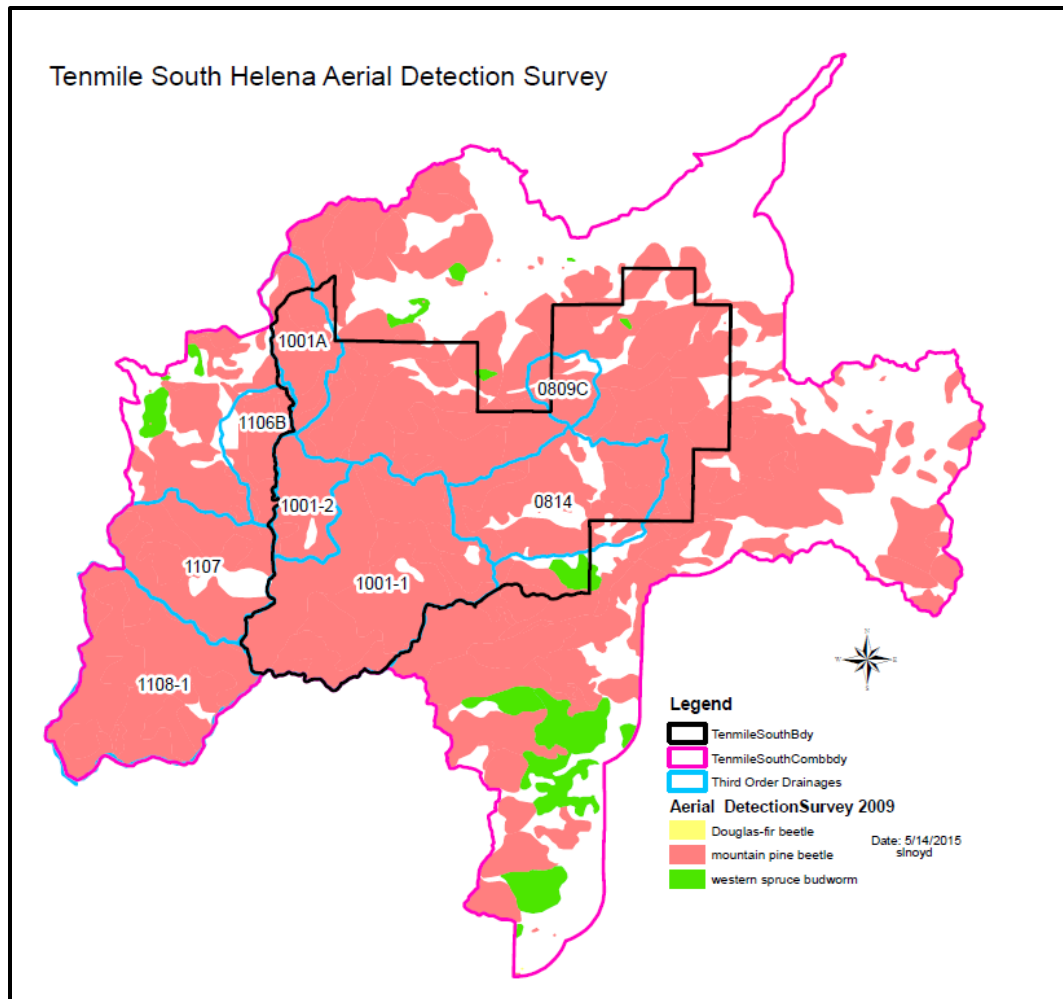


Figure 22. Extent of MPB mortality to pine forests at height of epidemic in 2009

While causing less dramatic effects, other insects are present within the combination boundary and project area. Most prevalent is western spruce budworm, with Douglas-fir beetle. WSB is a defoliator which is affecting mainly Douglas-fir in the Flume Chessman analysis area, but also impacts Engelmann spruce and subalpine fir. There is potential for WSB to continue affecting large expanses of Douglas-fir. This defoliator has been active since roughly 2005 with the highest amount of defoliation occurring in 2006 and 2009; although it has subsided in recent years due to cool, wet springs WSB defoliation has continued above endemic levels due to existing multi-layered stand structures (see map below of most recent available ADS flight data). DFB has been

mapped only at endemic levels. However, there is potential for DFB to increase in populations in susceptible Douglas-fir stands, especially in stands stressed by overstocking, drought, and WSB.

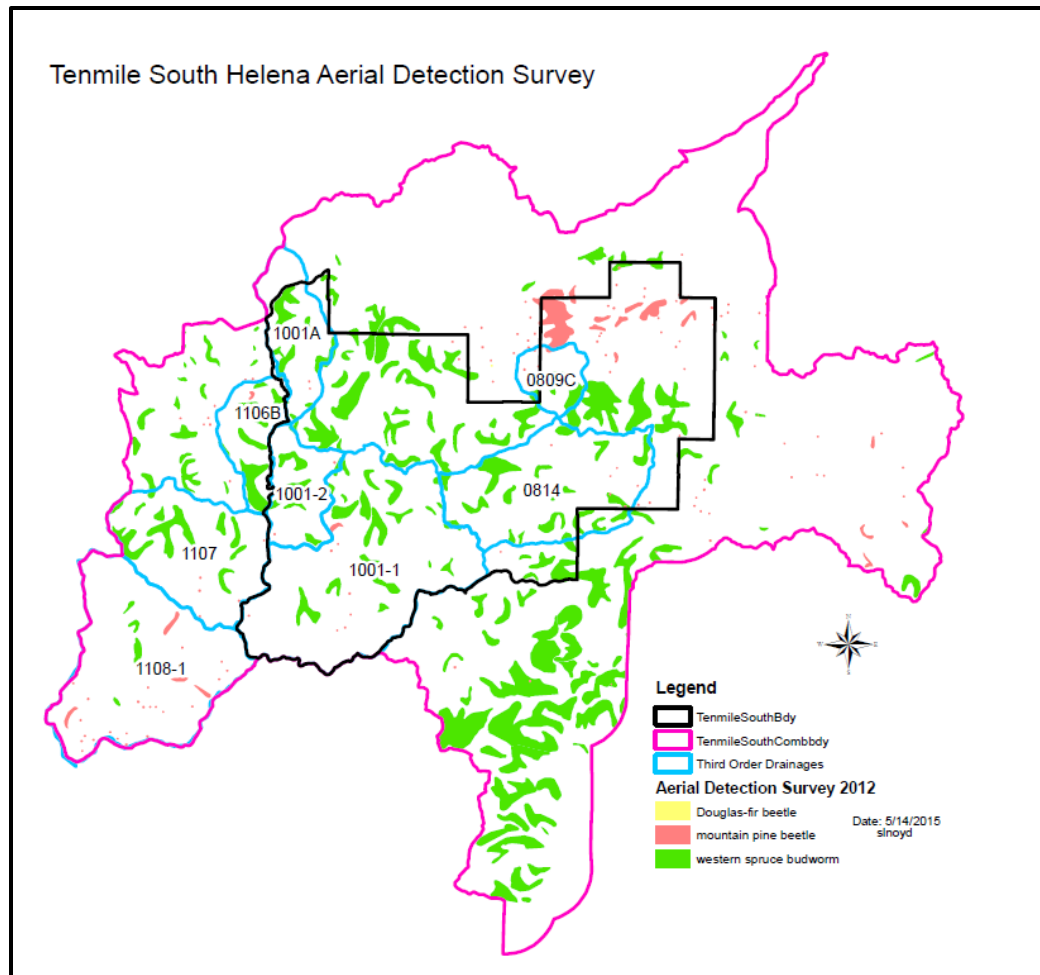


Figure 23. Extent of WSB defoliation to fir and spruce forests in 2012

Bark Beetles and Climate Change

Climate change may affect the dynamics of insect populations in two ways: directly through the physiological processes of insects; and indirectly through their host plants and natural enemies (Williams and Liebhold 2002). Changes in climate, particularly toward hotter and drier conditions, may increase the frequency of outbreaks and allow bark beetles to move northward or higher in elevation into other ranges of their host species or the ranges of new potential hosts (Williams and Liebhold 2002). Temperature increases may predispose forest ecosystems to stresses, acting both directly through increasingly negative water balances and indirectly through increased frequency, severity, and extent of disturbances, chiefly fire and insect outbreaks (McKenzie et al 2007). During mountain pine beetle outbreaks, widespread tree mortality reduces forest carbon uptake and increases future emissions from the decay of killed trees (Kurz et al 2008).

Bark Beetles and Fire

The interaction of bark beetles, fuels and fire is complex. Studies have shown that beetle outbreaks lead to changes in fire behavior (Jenkins et al 2007). Fire behavior varies in post-outbreak stands depending upon when they occur; the net result of epidemics is a substantial change in species composition and a highly altered fuels complex. Early in epidemics there is an increase in the amount of fine surface fuels. In post-epidemic stands large, dead, woody fuels and live surface fuels dominate. For surface fires both rate of spread and fireline intensity are higher in epidemic than in endemic stands. Passive crown fires are more likely in post-epidemic stands but active crown fires are less likely due to decreased aerial fuel continuity. Schmid et al 2007 suggest that MPB-killed trees result in increases in dry fuel loads and thereby increase the potential for severe fires.

Rusts, fungi, and microbes

The bulk of rust, fungi and microbes occurring in the Tenmile – South Helena project area are important components of ecosystem function and structure. The most significant root diseases within the project area are Armillaria root disease (*Armillaria ostoyae*) and Schwenitzii root and butt rot (*Phaeolus schweinitzii*).

Although root diseases cause mortality and growth loss, they also influence structure and species composition across landscapes. They also influence succession, especially in the absence of natural fire (USDA 2007). On sites with a root disease-susceptible forest type and climax, high levels of disease will maintain early stand development. These stands experience waves of mortality as trees become large enough for their root systems to contact the disease.

Alternatively, white pine blister rust (*Cronartium ribicola*) is a non-native species that has negatively affected five-needle pines in the western US during a portion of its life cycle (McDonald and Hoff 2001). Limber and whitebark pines are the only five needle pines on the HLCNF; whitebark pine is the most common on the forest. Limber pine occurs in very minor amounts in the project area; whitebark pine comprises about 4 percent of the project area but in a scattered occurrence. In portions of the HLCNF white pine blister rust has resulted in widespread mortality of whitebark pine and limber pine; although a comprehensive field review of higher elevations within the Tenmile – South Helena project area has not been done, the stands that have been viewed show moderately to severely impacted whitebark pine overstory trees by a combination of blister rust and mountain pine beetles.

Fire

Fire was historically the predominant natural disturbance in the Tenmile – South Helena project area and lightning ignitions largely determined where and when fires started (Agee 1993; Baker 2002; Pyne 1982); while indigenous burning is presumed to have occurred at lower elevations within the project area (Kimmerer and Lake 2001).

Fire frequency determines vegetation successional stage and fuel conditions and past fire shape and size play a role in fuel connectivity and landscape heterogeneity or homogeneity (Arno et al. 2000, Turner et al. 1998). Summer persistent snow pack in

high elevation forests historically resulted in high fuel moisture and low potential for fire spread on an annual basis; extended time between fires then cause a buildup of high fuel loading so that when a fire does become established, fire is more readily able to spread from surface to crown with potential for canopy consumption in these forests (Romme 1982). These trends in fire and the relationship between fire and climate in the northern Rocky Mountains existed in the distant (Heyerdahl et al. 2008) and recent past (Morgan et al. 2008). Fire regimes are differentiated by the frequency, extent, severity, and timing of fire events associated with vegetation. The presence or absence of fire does play a key role in the composition and structure of vegetation that occurs in the project area. The frequency and severity of past fires can to a certain extent be determined by looking at the existing condition of the different vegetation types in the project area. Although variable, natural fire intervals are a reflection of the vegetation types that occur in broad elevational, aspect and slope bands across the project area.

Based on research performed at larger scales, in general low elevation dry forests in the Northern Rockies have experienced changes in disturbance processes, structure, and function. Causes of change include fire suppression, forest management, and climate change (Hessburg and Agee 2003; Hessburg et al. 2005; Westerling et al. 2006). Changes include higher tree density, more multi-storied stands and ladder fuels, and a greater homogeneity of structures across the landscape which result in a greater probability for disturbances to affect large contiguous areas (Hessburg et al. 2005). Forest types with naturally high fire frequencies and mixed severity regimes, primarily ponderosa pine and Douglas-fir, have been altered substantially (Hessburg et al. 2005). The forest conditions described by research in the Northern Rockies are observed in the forest vegetation within the project area. Fire in dry forests has shifted from low-intensity, high frequency regimes to moderate and high-severity regimes, with consequent increases in uncharacteristic large-scale stand-replacing fires (Lehmkuhl et al. 2007). Landscapes are increasingly homogeneous in composition and structure, and the regional landscape is set up for severe, large fire and insect disturbance events (Hessburg et al. 2005). The role of fire as a stand replacement agent becomes more pronounced when the natural fire-free interval is increased through fire suppression.

Many small wildfires occur on the HLCNF annually; 42 fires occur every year including all lands on the HLCNF has administrative jurisdiction over for fire protection. A total of 194,173 acres have burned within the HLCNF administrative boundary since 1970 including private in-holdings, with a total of 537,690 acres having burned across all ownerships where a portion burned on the HLCNF. These wildfires burned on private, state, BLM and other National Forest Land as well as on the HLCNF. Since 1984, seven large wildfires have occurred. The occurrence of large fires increased in the 1980s, consistent with a trend throughout the West (Westerling et al. 2006). None of the large fires to date have burned in the Divide landscape area. The only significant fire to occur in the area was the MacDonald Pass fire of 2009, which burned roughly 170 acres.

Table 19. Major historic fires on the HLCNF since 1970

Fire Name	Year	Acres Burned	Landscape
North Hills	1984	26,950*	Big Belt Mountains
Canyon Creek	1988	211,490*	Blackfoot/Bob Marshall
Warm Springs	1988	46,900	Elkhorn Mountains
Cave Gulch	2000	29,024	Big Belt Mountains
Maudlow/Toston	2000	81,687*	Big Belt Mountains
Snow/Talon	2003	37,405	Blackfoot
Meriwether	2007	46,298*	Big Belt Mountains

Historic fire disturbances have been quantified for the HLCNF using a coarse-filter approach which analyzed the pattern of fire disturbance that would have historically burned prior to settlement by European Americans (Hollingsworth 2004). Burning by Native Americans was considered part of the historic fire regime. This analysis found that Forest-wide, historically 156,615 to 792,330 acres would have burned per decade (Hollingsworth 2004). While fire exclusion aided by cool moist climate conditions resulted in acreage burned well below historic levels prior to 1970, more recent decades are approaching historic levels of acreage burned despite fire suppression efforts in part due to warmer, drier climate conditions. The historic analysis also showed results for each landscape on the HLCNF. The Divide landscape, where the Tenmile – South Helena project is located, historically would have burned an average of 39,124 to 170,242 acres per decade (Hollingsworth 2004). These fires would have included low to moderate intensity in dry conifer fire groups and stand-replacing fire in moist conifer fire groups. Fire occurrence data indicate that essentially no large fires have occurred on this landscape in the last century. The lack of fire on the Divide landscape – principally a result of fire suppression efforts – has resulted in an altered mosaic of vegetation.

The vegetation conditions that exist today in Tenmile watershed (the western part of the project area) were shaped not only by fire suppression, but also climatic trends, large fires that occurred prior to settlement, and fuelwood cutting that occurred around the turn of the previous century to support the mining and railroad industries. Modern timber harvest has also caused some change, although very little harvest has occurred. Fire history maps indicate that much of the area burned in a large wildfire in approximately 1890. Fuelwood cutting for the mining and railroad industries was also common around the turn of the century. The climate early in the 20th century when forests were re-establishing following these disturbances was generally cool and moist, conducive to forest growth. The landscape became characterized by relatively densely stocked stands dominated by even-aged lodgepole pine, with some subalpine fir and spruce at upper elevations and drier Douglas-fir dominated at lower elevations. With the exception of small fires that were suppressed, the homogeneity of this landscape has been largely unbroken. While stand replacement effects would have been typical, there would also have been mixed and low severity fires that left substantial remnant components. The limited areas of past harvest have regenerated and support young forested stands which are less susceptible to bark beetle attack; today these areas stand out as “green forest” areas surrounded by dead and dying trees impacted by the mountain pine beetle.

The South Hills portion of the project area (the eastern part) is lower in elevation, and is a landscape of large grasslands and dry forests. Historically, many dry coniferous forests were shaped by frequent, low-intensity fire; this included the warm, dry as well as moist Douglas-fir habitat types of the Tennile – South Helena project area. This disturbance regime sustained open, large-tree dominated structures with diverse and productive understory communities (Arno 1980, Hessburg and Agee 2003). However, over the last century, fire suppression, livestock grazing, and high-grade logging, among other factors, have altered the structure and function of dry coniferous forests across much of western Montana, including the project area. Forest structure and composition has been most significantly altered with the lack of fire disturbance; the disruption of the natural fire intervals of the past have resulted in higher stand densities, multi-layered stands of mostly one species, Douglas-fir. Dramatically higher stand densities and development of ladder fuels (Covington and Moore 1994; Arno et al 1995; Peterson et al 2009) increase the risk of uncharacteristically severe wildfire (Everett et al 2000; Friederici 2003), bark beetle infestations (Fettig et al 2007), and in some areas such as the Tennile – South Helena project area, successional replacement by shade-tolerant competitors (Fischer and Bradley 1987; Mutch et al 1993; Habeck 1994; McKenzie et al 2004).

Landscape Mosaic

Although a combination of disturbance factors contribute to size class distribution in forest types, the dominant disturbance factor determining current forest structure has been the on-going mountain pine beetle epidemic. Land management activities within the project area by both Forest Service and private land owners have had a minor effect on the landscape mosaic. Past regeneration harvest of 1,461 acres created a stand initiation phase (early seral) patch mosaic over time, with the current state of most of the past treatments now being in mid-seral condition. The MBP re-set a substantial acreage (23,541 acres) from a mid- to late seral condition into principally a mid-seral condition. With the mortality to overstory trees from MPB, there has been a dramatic shift from a project area dominated with mature structure to a younger stand structure (wherein the overstory trees are dead and what is remaining are smaller diameter trees not affected by the beetle and new regeneration of seedlings).

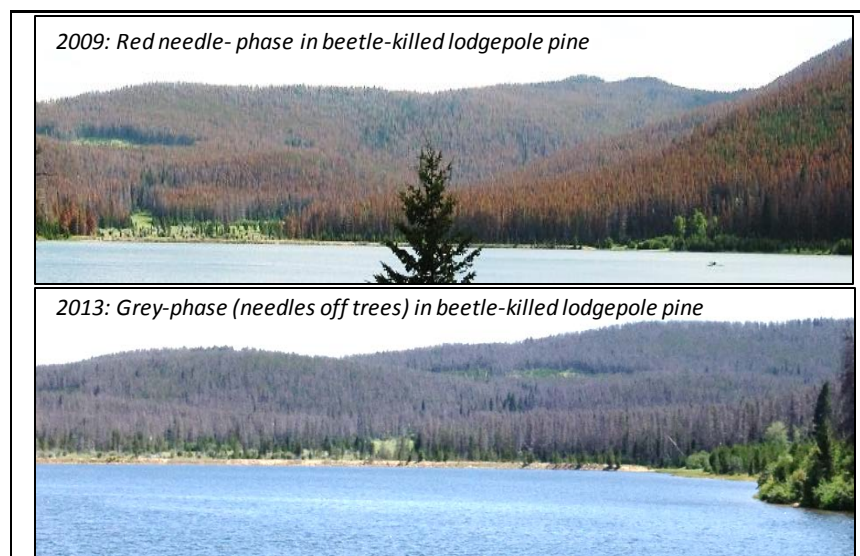




Figure 24. Overstory mortality has created available sunlight to allow stand initiation to occur

Land Management Practices

The majority of Forest Service prescribed fire use has been disposal of logging slash or rearrangement of fuels. Some prescribed fire use has been for improving stand conditions for certain vegetation species (e.g. removing conifer succession in grassland-shrubland areas). Prescribed fire has occurred on about 9 percent of the project area over the past 70 years (4,908 acres; see Table 20 below).

Timber was harvested in the Tenmile – South Helena project area to support mining, homesteading and settlement out in the valley. Timber harvest increased from the 1970s until now. Timber harvest activities included clearcut, seed tree, shelterwood, selection cut, and intermediate harvest (commercial thinning). Commercial timber harvest has occurred on about 5 percent of the project area (2,201 acres; see Table 20 below).

Table 20. Past timber harvest and fuels activities within the project area

Decade of Activity	Activity	Activity Acres	Total Acres
1960-69	Timber Harvest	Regen Harvest: 45 acres Intermediate Harvest: 3 acres	48
	Fuels Activities	Fuels acres: 32 acres	32
1970-79	Timber Harvest	Regen Harvest: 444 acres Intermediate Harvest: 0 acres	444
	Fuels Activities	Fuels acres: 428 acres	428
1980-89	Timber Harvest	Regen Harvest: 299 acres Intermediate Harvest: 0 acres	299
	Fuels Activities	Fuels acres: 85 acres	85
1990-99	Timber Harvest	Regen Harvest: 36 acres Intermediate Harvest: 104 acres	168
	Fuels Activities	Fuels acres: 238 acres	238
2000-09	Timber Harvest	Regen Harvest: 8 acres Intermediate Harvest: 18 acres	26
	Fuels Activities	Fuels acres: 1,878 acres	1,878
2010-2015	Timber Harvest	Regen Harvest: 629 acres Intermediate Harvest: 513 acres	1,142
	Fuels Activities	Fuels acres: 2,247 acres	2,247
	Other ⁷ Harvest (2005-2015)	Timber Harvest: 74 acres	74

Non-commercial tree thinning (also called pre-commercial thinning) has principally occurred in old regeneration harvest areas, including past clearcut, seed tree and shelterwood units. Non-commercial thinning has occurred on less than 1 percent of the project area (135 acres; see Table 21 below).

Table 21. Non-commercial tree thinning within the project area

Activity	Pre-1980	1980-1989	1990-1999	2000-2009	2010-2014	Grand Total
Precommercial Thin	0	19	93	23	0	135
Total	0	19	93	23	0	135

Cattle grazing in the past has been of variable intensity. The effects of grazing may have contributed to the spread of invasive plants, such as knapweed, although the majority of invasive plant introduction is from motorized routes (roads and trails). Invasive weeds have been treated and are continuing to be treated with herbicides; dry grassland parks are susceptible to the threat of invasive weeds. (Refer to the Noxious Weeds and Livestock Grazing analysis.)

⁷ Timber harvest on Other than National Forest System lands, which include private, BLM and City of Helena. Acreage estimated from latest imagery.

Stand Structure Created from Disturbance

Although a combination of disturbance factors contribute to size class distribution in forest types (such as past management actions), the dominate disturbance factor has been the recent MPB epidemic. However, the cumulative effects of fire suppression management strategies over the past 100 years pre-disposed the pine forest types in the project area to a beetle outbreak. More recent changes in climatic conditions provided opportunity for sustained beetle outbreaks that occurred simultaneously across western North America that are the largest and most severe in recorded history (Bentz 2008); the HLCNF and the Tennile – South Helena project area were part of the regionally significant MPB epidemic.

The disturbances described in this analysis have resulted in a distribution of size classes; these are characterized below by dominance group (see below).

Table 22. Stand structure by dominance group for the project area

Dominance Group	Size Class					Total
	Early Seral (Seedling)	Mid Seral (5-9.9")	Mid to Late Seral (10-14.9")	Late Seral (15"+)	Hardwoods	
Subalpine fir	0	63	64	0	-	127
Subalpine fir with other shade tolerant conifers	0	666	595	75	-	1,336
Whitebark pine with lodgepole pine	4	65	4	0	-	73
Lodgepole pine	723	18,019	633	0	-	19,375
Lodgepole with whitebark pine or ponderosa pine	35	1,141	2,329	0	-	3,505
Engelmann spruce with other shade tolerant conifers	0	261	58	812	-	1,131
Ponderosa pine	0	873	555	1,682	-	3,110
Ponderosa pine with lodgepole pine	2	44	123	379	-	588
Douglas-fir	0	2,418	17,782	1,780		21,980
Douglas-fir with ponderosa pine and/or lodgepole pine	0	190	1,001	4	-	1,195
Quaking aspen	-	-	-	-	263	263
Cottonwood	-	-	-	-	93	93
Grand Total	763	25,033	21,852	4,732	356	52,736

For tree size, only tree lifeform areas are included in calculations (grass, shrub, water, and sparsely vegetated areas are excluded). Tree size classes of polygons in VMap are classified into four categories: early seral (seedling/sapling), mid- seral (small tree), mid-to late seral (medium tree), and late seral (large tree). Hardwoods are not displayed by size class. The MPB epidemic has shifted forest stand structure from mid- to late seral and late seral classes to mid-seral classes as large pine overstory trees die and are replaced by advanced regeneration of shade tolerant species and new pine seedlings. The beetle has shifted the structural stage, but has only slightly reduced the homogeneity of the landscape. In other words, rather than a landscape dominated by just larger trees, the

landscape is still relatively homogeneous but now dominated by a mix of mostly smaller trees and scattered large trees of varying density. Comparatively, on an individual stand basis what was once homogenous stands have now become much more heterogeneous (see Vegetation Types discussion below). Large living trees are increasingly rare.

Every pine stand that is larger than 5 inches in diameter has been affected by the mountain pine beetle epidemic in the project area (an estimated 23,541 acres of lodgepole pine and ponderosa pine with dead or dying trees over the majority of the stand). Although not reflected from VMap imagery in the dominance group table displayed above, MPB has caused a shift away from lodgepole pine composition in areas with more shade tolerant components, primarily Douglas-fir and subalpine fir. In the absence of fire these species may dominate formerly pine areas until the next disturbance, persisting and growing in areas with abundant lodgepole snags in the short term (the next five years; Mitchell and Preisler 1998) and ultimately jack-straw coarse woody debris when the snags fall. The resultant fuel loading will cause impediments to the growth of young seedlings, and may shade out some potential pine regeneration which requires open conditions to regenerate. In areas with little to no seed source for shade tolerant species, lodgepole may regenerate in MPB-killed areas as serotinous cones are opened by sunlight. In some areas with poor growing conditions, lack of exposed seedbeds, or a lack of seed, regeneration may be patchy or take some time to establish. Over time dominance groups could continue to shift according to natural successional pathways, influenced by natural disturbances.

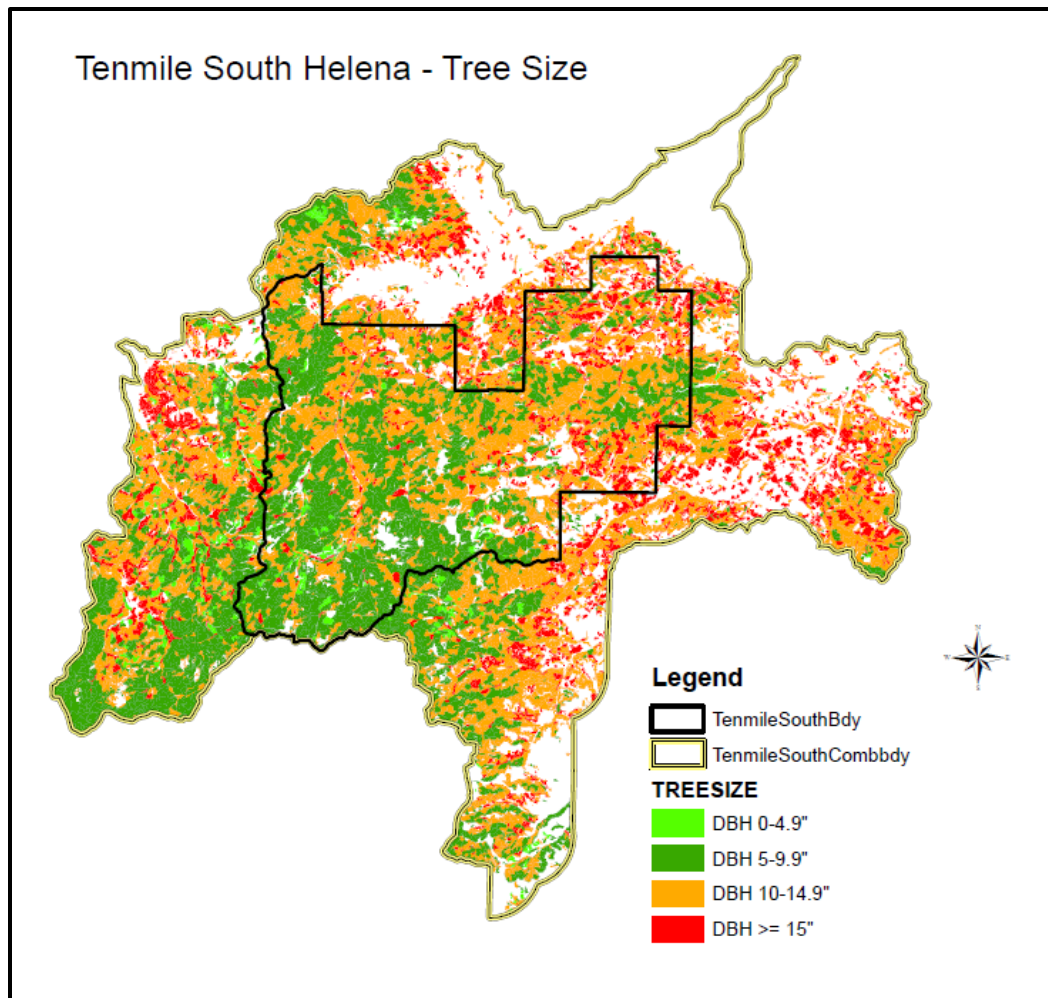


Figure 25. Tree size class

Tree canopy is another way to assess forest vegetation, providing a view of how dense stands are (see Table 23 and Figure 26 below). As with size class, only conifer tree lifeform areas are included for tree canopy. Conifer tree density (of living trees) is described using four classes tree canopy cover classified in VMap: low cover, low to moderate cover, moderate to high cover, and high cover. These classes do not incorporate the stems represented by dead trees that are still standing. Abundant dead trees (snags) are present across areas that were previously dominated by lodgepole pine.

Table 23. Tree canopy cover class in the project area

Tree Canopy Cover Class	Low 10-25% (acres)	Low to Mod 26-40% (acres)	Mod to High 41-60% (acres)	High >60% (acres)	Total Acres
Subalpine fir	15	47	45	21	127
Subalpine fir with other shade tolerant conifers	65	83	154	1,005	1,308
Whitebark pine with lodgepole pine	69	4	0	0	73
Lodgepole pine	54	501	4,726	14,093	19,375

Tree Canopy Cover Class	Low 10-25% (acres)	Low to Mod 26-40% (acres)	Mod to High 41-60% (acres)	High >60% (acres)	Total Acres
Lodgepole with ponderosa pine	26	66	197	2,735	3,025
Engelmann spruce with other shade tolerant conifers	0	11	204	916	1,131
Ponderosa pine	1,140	1,668	279	23	3,110
Ponderosa pine with lodgepole pine	175	324	48	0	547
Douglas-fir	33	1,127	9,220	11,599	21,980
Douglas-fir with ponderosa pine and/or lodgepole pine	143	107	347	598	1,195
Grand Total	1,850 (3.5%)	4,052 (7.7%)	15,316 (29.3%)	31,163 (59.5%)	52,381 (100.0%)

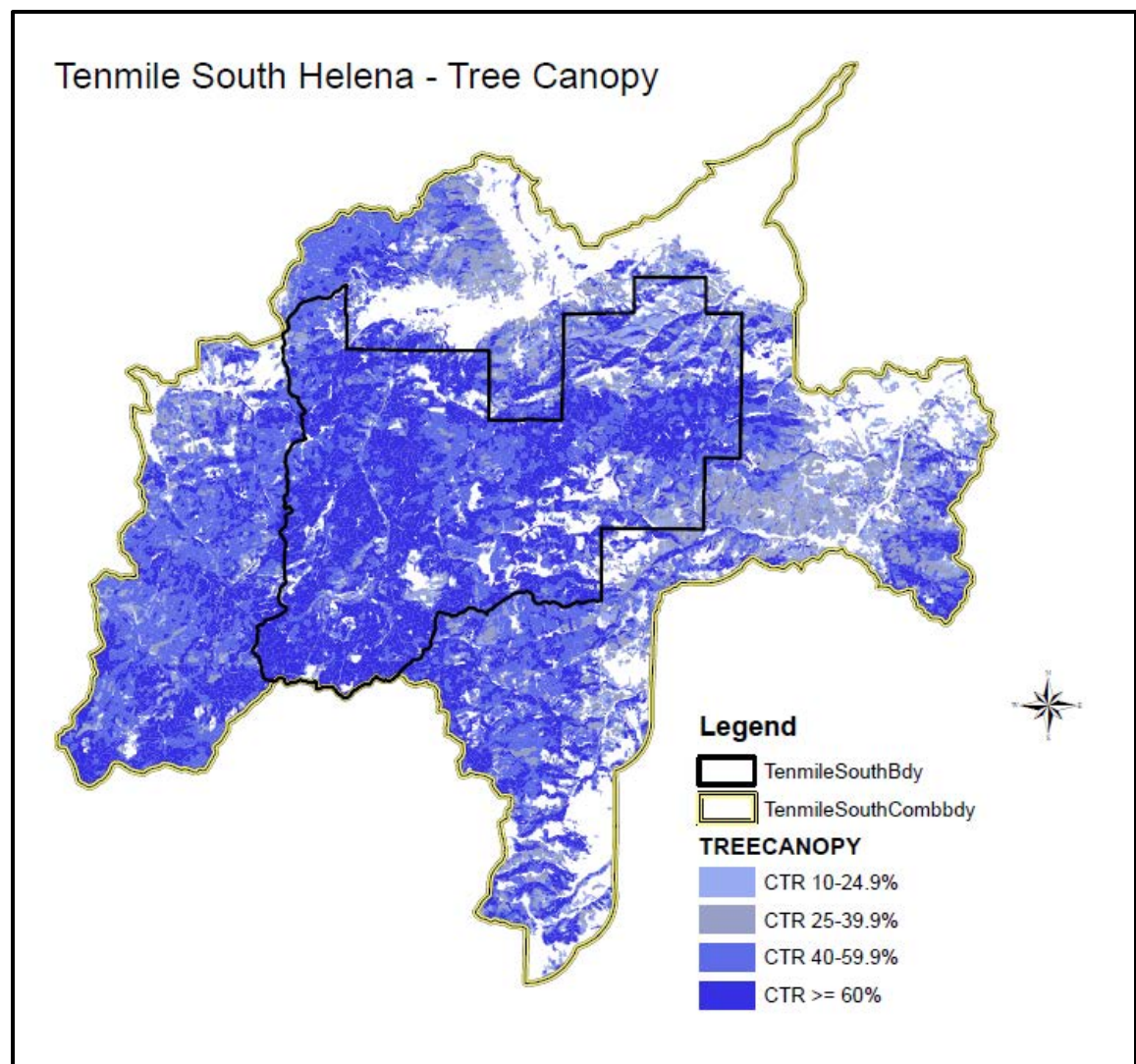


Figure 26. Tree canopy class map

Old Growth

Old growth stands as defined by the HNF Forest Plan (Green et al 1992, errata corrected 2007, 2008) do occur in the Tennile – South Helena project area. The old growth resource in the Tennile – South Helena project area has been impacted by the mountain pine beetle (MPB). Prior to the outbreak, the bulk of old growth stands identified by the R1 Old Growth utility were dominated by lodgepole pine. Due to the extensive MPB-caused mortality, many of these stands no longer provide old growth habitat.

The analysis areas for old growth are the third order drainages associated with the project (1001-1, 1001-2, 1001A, 0814, and 0809C). The third order scale applies to the old growth Forest Plan standard. Two of the third order drainages extend beyond the Project Area boundary: 1001A and 0809C. Potential old growth at the fine scale, within treatment units, was also addressed for the effects analysis.

Old growth is designated primarily where there is available data. The stand exam inventory is used to identify old growth stands; this sample is biased because it targeted productive stands with a high probability of containing commercial timber. The inventories therefore reflect a minimum amount of potential old growth. Old growth is not a static condition; however, frequent re-measurement or expansion of the inventory is prohibitive. Designations are re-examined at the project scale when treatments are proposed. When stand characteristics change substantially due to factors such as insects, disease, or wildfire, the stand is no longer considered old growth. Please refer to the project file for more detailed information (USDA 2012c).

The first step taken is modeling to identify potential old growth. The R1 Inventory Analysis Team ran the FS Veg utility that compared exam data with FACTS to determine if exams were still representative. “Clean” stands were run through the R1 Old Growth Utility in FS Veg to identify old growth (USDA 2010b). This report identifies stands that meet minimum criteria. The results of the algorithm were combined with GIS layers including third order drainage boundaries, past activities, and insect aerial detection surveys (ADS). Stands identified as old growth are checked to determine if changes have occurred since the exam. Non-adjacent stands smaller than 10 acres are eliminated; however these small areas are checked against proposed treatments to determine if a proposal may affect old growth.

Each third order drainage wholly or partially within the project area boundary is then assessed. Old growth is identified to represent 5 percent of the third order drainage. Stands known to be old growth based on the algorithm at least 10 acres in size (or smaller in adjacent groups) are designated first. Old growth in excess of 5 percent is not designated to manage as old growth per the Forest Plan, but remains identified as old growth for purposes of habitat analyses. The criteria used for selection includes age (oldest); size (largest stands or contiguous areas); elevation (below 6000 feet); riparian areas; and management area (not T-1 through T-5); and non-pine forest types in areas heavily infested with MPB. The other Forest Plan prioritization criteria are used when possible but often the limited amount of old growth and data available does not offer abundant choices. Also, the topography of a given watershed does not always provide abundant riparian or areas below 6000 feet. These criteria are meant to provide a prioritization guide when possible, and are used as such. If old growth identified by the

algorithm do not constitute 5 percent, additional areas are designated which may not meet old growth definitions yet, but are the “next best thing”. The Forest Plan criteria (oldest, largest, riparian, non-timber emphasis) are applied to determine the “next best thing”. The inventoried stands that best meet the most considerations are selected to designate for old growth management. Remote imagery, photo interpretation, and strata/habitat type information as well as field surveys may also be used to designate old growth.

Designation in the Tenmile – South Helena area was challenging due to high landscape homogeneity, dominated by dead and dying lodgepole pine affected by the MPB. Stands with exams were selected where available, with the exception of mature lodgepole pine impacted by the MPB. In some cases stands without exams were selected where no better options were available. All stands were reviewed with aerial photography and past activity layers. Additionally, in 2014 a sample of designated old growth stands had walk-through surveys done to assess whether conditions had changed since designation. These stands were relatively unchanged, or still are the most viable next-best-thing option for designation.

Next, proposed treatment units were evaluated to assess whether they could be old growth, particularly where there is no stand exam available. Diagnoses were done in 2013 and 2014 which identified areas where exams were needed to determine if the site was old growth. In 2014, stand exams were conducted where the potential for old growth was identified. Some of these are located within third order drainage boundaries, and some are not. The determination of old growth is important for not only for Forest Plan Consistency, but also for wildlife habitat, and other project objectives and design. None of these areas were old growth based on the results of the R1 Old Growth Utility run against the new data.

An analysis of old growth over large landscapes using FIA data was completed. In the Divide Landscape, there is an estimated 9.8 percent of the Forest in old growth with a 90 percent confidence interval of 6.2 – 13.6 percent. This old growth analysis indicates that old growth in the Divide Landscape is not deficient at the regional scale; although the amount of old growth has dropped in the last few years due to MPB-related mortality.

Forest Plan Required Old Growth – Third Order Drainages

There are five third order drainages associated with the project: 1001-1, 1001-2, 1001A, 0814, and 0809C. Five percent of each has been designated to be managed as old growth, selecting known old growth or the “next-best thing”. The acres used only include FS ownership. The availability of data, topography, and existing conditions required some stands to be selected that do not meet all the prioritization criteria in the Forest Plan. These criteria are meant to aid in selection when choices are available; they were used as such but choices were limited. The map of existing old growth is in the project file.

Table 24. Designated old growth stands in third order drainages

3rd Order Drainage	Stand Identification	Habitat Type Group	Is OG today?	NBT ⁸	Acres in 3rd Order	Percent of 3rd Order
1001-1	31601043	PSME	YES	NO	0.2	1% old growth 5% with NBT added
	31802064	PICO	YES	NO	34.8	
	31902159	PIEN-ABLA	YES	NO	8.0	
	31903030	PICO	YES	NO	47.7	
	31903107	PIEN-ABLA	YES	NO	43.5	
	32101026	PSME	YES	NO	0.1	
	31902149	PIEN-ABLA	NO	YES	21.5	
	31903114	PIAL-PIFL2	NO	YES	36.5	
	31902061	PIEN-ABLA	NO	YES	50.4	
	31701110	PICO	NO	YES	60.4	
	31702007	PICO	NO	YES	15.5	
	31702020	PICO	NO	YES	34.6	
	31901033	PSME	NO	YES	62.1	
	31902049	PIEN-ABLA	NO	YES	39.7	
	31901057	PICO	NO	YES	56.2	
	31901058	PICO	NO	YES	7.9	
	31902007	PICO	NO	YES	31.4	
	31702126	PIAL-PIFL2	NO	YES	41.3	
	31903110	PIEN-ABLA	NO	YES	22.7	
	31702105	PICO	NO	YES	25.9	
	31702108	PICO	NO	YES	12.6	
	31802029	PICO	NO	YES	32.3	
	31802043	PICO	NO	YES	24.1	
	31902059	PICO	NO	YES	73.0	
	31903002	PICO	NO	YES	13.3	
	31901015	PICO	NO	YES	66.9	
	31901050	PICO	NO	YES	21.9	
	31901034	PIEN-ABLA	NO	YES	8.0	
1001-2	31801055	PSME	YES	NO	30.1	2% old growth 5% with NBT added
	31801073	PSME	YES	NO	15.5	
	31801082	PSME	YES	NO	13.0	
	31802064	PICO	YES	NO	7.2	
	31801136	PIEN-ABLA	NO	YES	19.2	
	31801088	PIEN-ABLA	NO	YES	70.5	
1001A	30901057	PICO	YES	NO	0.01	5% old growth
	30902002	PICO	YES	NO	10.6	

⁸ NBT: If old growth identified by third order drainage do not constitute 5%, additional areas are designated which may not meet old growth definitions yet, but are the "next best thing" using the Forest Plan criteria (oldest, largest, riparian, non-timber emphasis).

3rd Order Drainage	Stand Identification	Habitat Type Group	Is OG today?	NBT 8	Acres in 3rd Order	Percent of 3rd Order
	30902006	PICO	YES	NO	31.2	
	30902016	PSME	YES	NO	15.0	
	30902021	PICO	YES	NO	2.8	
	30902034	PSME	YES	NO	7.0	
	30902039	PSME	YES	NO	15.5	
	30902111	PICO	YES	NO	15.7	
	30903026	PICO	YES	NO	3.5	
	30903051	PICO	YES	NO	15.7	
	30903052	PICO	YES	NO	5.5	
	30903065	PSME	YES	NO	0.01	
	30903067	PSME	YES	NO	0.03	
	31001021	PSME	YES	NO	23.9	
	31001022	PSME	YES	NO	2.7	
	31001058	PSME	YES	NO	14.9	
	31001079	PICO	YES	NO	19.1	
	31001084	PICO	YES	NO	22.6	
0814	31501086	PIPO	YES	NO	11.4	1% old growth 5% with NBT added
	31601039	PIEN-ABLA	YES	NO	12.3	
	31601041	PICO	YES	NO	12.7	
	31601043	PSME	YES	NO	4.3	
	31601060	PSME	YES	NO	4.8	
	31602018	PSME	YES	NO	7.2	
	31602054	PICO	YES	NO	26.2	
	31602079	PSME	YES	NO	7.1	
	31603044	PSME	YES	NO	4.2	
	31602008	PSME	NO	YES	153.6	
	31602006	PSME	NO	YES	17.2	
	31602036	PSME	NO	YES	20.6	
	31601016	PSME	NO	YES	40.2	
	31602009	PSME	NO	YES	62.8	
	31202050	PSME	NO	YES	21.3	
	31603054	PSME	NO	YES	17.2	
	31501085	PSME	NO	YES	30.9	
	31602005	PSME	NO	YES	44.9	
0809C	31603056	PICO	NO	YES	17.3	No old growth 5% with NBT added
	31301026	PSME	NO	YES	13.2	
	31301057	PSME	NO	YES	31.4	
	31301056	PSME	NO	YES	13.6	
	31301024	PSME	NO	YES	20.8	

Existing Old Growth Outside of Third Order Drainages

Old growth is also identified within the project area through stand examinations that is outside of third order drainages. These existing old growth stands are not “designated” for Forest Plan purposes for only one reason – these old growth stands are not in a third order drainage. However the stands are old growth and do provide additional old growth habitat within the project area.

Table 25. Non-designated old growth within project area, but outside third-order drainages

Stand ID	Habitat Type Group	Acres
31501086	PIPO	11.5
31903107	PIEN-ABLA	43.5
31502006	PIPO	20.1
31602054	PICO	26.2
31802064	PICO	41.9
31201004	PICO	77.4
31502001	PIPO	11.5
31601041	PICO	12.6
31501095	PIPO	30.8
31201027	PSME	47.3
31502050	PSME	37.8
31002118	PSME	21.9
31502032	PSME	21.6
31903030	PICO	47.7
31201012	PSME	7.7
32104050	PSME	20.7

Snags

Snags are abundant across all scales of interest due to MPB. Estimates of Snag Densities for Eastside Forests in the Northern Region (Bollenbacher et al 2008) utilizing Eastern Montana snag data provides a replacement for the Northern Region Snag Protocol for eastside Montana forests in Region 1. The information provided does not set forth required direction but rather provides current snag data and analysis for consideration by Forests (Bollenbacher et al 2008). This publication is the best available science to help guide snag management, and aids Forests in determining realistic snag management targets within the Forest Plan framework.

At the Forest, landscape, and third order drainage scales, the HLCNF summary database was used to derive estimates of snags per acre by size classes consistent with the Forest Plan.

Forest Plan consistency is assessed at the third order watershed scale. ADS bark beetle infestation data was combined with third order drainage boundaries to describe snag conditions, within the project area. The ADS layer includes an estimate of the number of trees killed on polygons where bark beetle activity was seen; these estimates do not

include diameters of snags. This data was averaged for the scale of interest to generate an estimate of average TPA of snags.

Snags: Forest Plan Consistency – Standards

The indicator for effects to snags correlates to the Forest Plan standard of providing for a minimum of 2 snags per acre at the third order drainage scale.

The primary analysis areas used for snags is the same as used for old growth, and are the third order drainages associated with the Tenmile –South Helena Project: 1001-1, 1001-2, 1001A, 0814, and 0809C. Two of the third order drainages extend beyond the Project Area: 1001A and 0809C. This analysis scale allows for a direct evaluation of Forest Plan Consistency. Additionally, snags are displayed for the Forest, Divide Landscape, Project Area and Combination Boundary scales to provide additional habitat information.

Existing Condition of Snags

The Summary Database is used to summarize snags at broad scales utilizing FIA grid intensification plots. The size classes are consistent with the Forest Plan and estimates have 90 percent confidence intervals. Snags in smaller size classes have nearly doubled since estimates made prior to the MPB. The estimate for snags >20" dbh has remained fairly similar; this is because most of the trees killed by MPB at both scales were lodgepole pine which do not typically grow greater than 20 inches dbh. Large snags are not abundant because large live trees are also limited due to the low productivity of sites within the project area. (Table 26. Snags per acre at Broad Scales, forest plan size classes below displays the number of live trees greater than 20 inches across the HLCNF and Divide Landscape; this would be the number of trees available to become large diameter snags in the near future and portrays how few large trees are on the HLCNF.) The large live trees greater than 20 inches that remain available for snag recruitment are likely Douglas-fir or Engelmann spruce.

Table 26. Snags per acre at Broad Scales, forest plan size classes

Forest Plan Size Classes	Snags per acre HLCNF-wide	Snags per acre Divide Landscape
7-11.9" dbh	49.64	63.66
12-19.9" dbh	12.10	9.93
>20" dbh	1.15	0.41
Live Trees/Acre >20" dbh	2.04	2.18

FIA grid intensification plots are available to summarize snags by Forest Plan size classes, and are displayed in Table 27. These plots were re-measured for live/dead trees in the last several years. Due to the landscape predominance of lodgepole pine, there are virtually no estimated snags greater than 20 inches dbh.

Table 27. Snags per acre by forest plan size classes, project area and combination boundary

Forest Plan Snag Size Classes	Project Area	Combination Boundary
7-11.9"	67.4	54.2
12-19.9"	6.9	7.5
20"+	0.0	0.3

Existing Condition of Snags in Relation to Forest Plan Standards

Forest Plan consistency is assessed at the third order drainage scale by summarizing the estimated quantity of beetle-killed trees. These snags are primarily medium to large sized dead lodgepole pine. This snag pulse is transitory, and after these trees fall snags could become rare; the majority of the beetle-killed trees are expected to be on the ground in the next 5 years (Mitchell and Preisler 1998). Large diameter (>20" dbh) and snags of species other than lodgepole are relatively rare. The snag numbers from ADS represent a minimum estimate because ADS does not reflect older dead trees or those killed by other causes such as fire. Diameters cannot be derived from ADS; however, since large trees are preferred by bark beetles, snags likely belong to the largest sizes available. Acres infested are not cumulative because spatial overlaps occur yearly. Estimates of trees per acre infested, however, are cumulative because ADS records only currently infested trees each year. This analysis shows that the average snags per acre across the third order drainages far exceed the Forest Plan minimum of 2 per acre. The distribution of snags in third order drainages is fairly contiguous and intensive.

Table 28. Snags created by bark beetles in third order drainages, 2006-2012 (ADS)

Year of ADS	The estimated number of trees killed within each 3 rd order drainage				
	1001-1	1001-2	1001A	0814	0809C
2006	711	355	48	337	13
2007	5,933	2,969	7,881	8,897	118
2008	583,244	346,289	502,238	400,326	40,353
2009	808,333	266,245	286,339	257,984	16,981
2010	140,658	34,536	27,195	22,954	7,466
2011	71,718	5,582	3,542	6,730	1,934
Total Snags	1,610,597	655,976	827,243	697,228	66,865
Total acres affected	16,096	3,367	4,014	9,782	1,932
Average snags/acre	100	195	206	71	35

The Summary database was also used to summarize snags at the third-order drainage scale. Relatively few plots are available in these analysis areas, resulting in lower statistical confidence. However the information is provided to show a correlation with Forest Plan size classes.

Table 29. Snags per acre by forest plan size class, third order drainages, summary database

Forest Plan Snag Size Classes	1001-1	1001-2	1001A	0814	0809C
7-11.9"	109.4	96.3	108.3	12.0	0.0
12-19.9"	6.6	12.0	0.0	36.1	0.0
20"+	0.0	0.0	0.0	0.0	0.0

Vegetation Types

Existing Vegetation Summary

Vegetation within Tenmile – South Helena project area is summarized and displayed below in Table 30 and Figure 27.

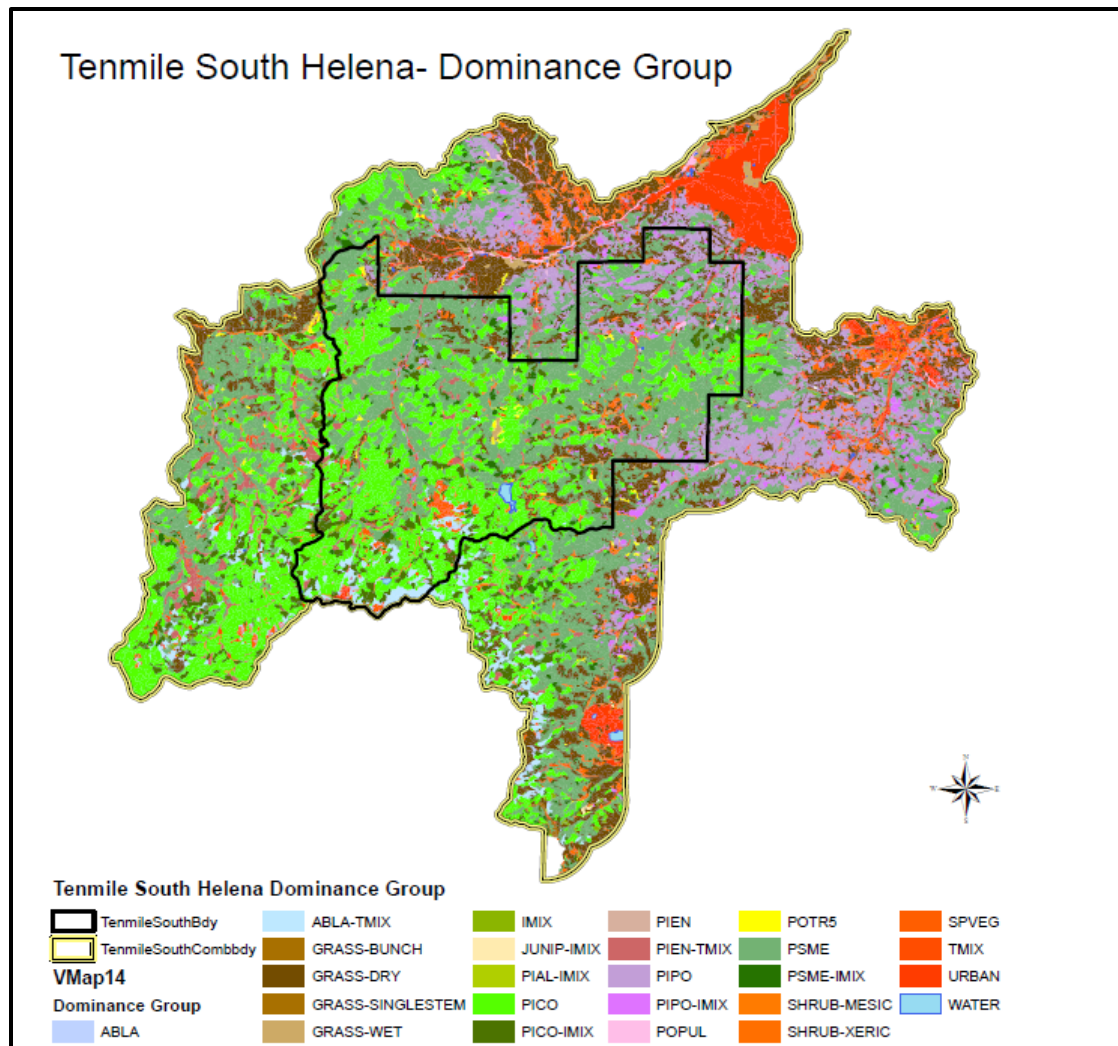


Figure 27. Distribution of cover types for the Tenmile – South Helena project area

Table 30. Existing cover types by dominance group for the project area

DOMINANCE GROUP	Total Acres	DOMINANCE GROUP	Total Acres
Urban	561	Whitebark pine with lodgepole pine	73
Sparse Vegetation	855	Lodgepole pine	19,375
Dry grasslands	4,768	Lodgepole pine with whitebark pine or ponderosa pine	3,505
Wet grasslands	334	Engelmann spruce with other shade tolerant conifers	1,131
Mesic shrublands	541	Ponderosa pine	3,110
Xeric shrublands	380	Ponderosa pine with lodgepole pine	547
Water	169	Quaking aspen	263
Douglas-fir	21,980	Cottonwood	93
Douglas-fir with ponderosa pine and/or lodgepole pine	1,195	Subalpine fir with other shade tolerant conifers	1,336
		Subalpine fir	127
Grand Total			60,349

Douglas-fir and ponderosa pine vegetation type

Historically, many dry coniferous forests were shaped by frequent, low-intensity fire; this included the warm, dry as well as moist Douglas-fir habitat types of the Tenmile – South Helena project area. This disturbance regime sustained open, large-tree dominated structures with diverse and productive understory communities (Arno 1980; Hessburg and Agee 2003). However, over the last century, fire suppression, livestock grazing, and high-grade logging, among other factors, have altered the structure and function of dry coniferous forests across much of western Montana. Forest structure and composition has been most significantly altered with the lack of fire disturbance; the disruption of the natural fire intervals of the past have resulted in higher stand densities, multi-layered stands of mostly one species, Douglas-fir. In addition, the recent MPB epidemic killed a high percentage of ponderosa pine within the project area, lowering species diversity and skewing the dominance of Douglas-fir over pine. Dramatically higher stand densities and development of ladder fuels (Covington and Moore 1994a; Arno et al 1995; Peterson et al 2009) increase the risk of uncharacteristically severe wildfire (Everett et al 2000; Friederici 2003), bark beetle infestations (Fettig et al 2007), and in some areas such as the Tenmile – South Helena project area, successional replacement by shade-tolerant competitors (Fischer and Bradley 1987; Mutch et al 1993; Habeck 1994; McKenzie et al 2004).

Along with dry grassland parks, Douglas-fir with ponderosa pine dominates the low to middle elevations of the Tenmile – South Helena project area (26,832 acres or 44 percent of the project area; see Table 30 above). In contrast to early 1900s conditions of open-grown, larger diameter stands of Douglas-fir and ponderosa pine, current Douglas-fir stands in the project area are continuous, mid- successional and densely stocked, and establishing into dry grassland and quaking aspen communities. The increase in extent and continuity of this coniferous vegetation type has effectively reduced landscape vegetation heterogeneity and associated biodiversity and put unique habitat types of the

Tennmile – South Helena analysis area (most importantly quaking aspen and seral ponderosa pine communities) at risk of irreversible habitat conversion. Highly dense stands of Douglas-fir have been affected by western spruce budworm and an increase of individual trees killed by Douglas-fir bark beetle has been noted in the analysis area through field surveys. Additionally, mortality of very large ponderosa pine through bark beetles has been noted in the analysis area through field surveys.

Lodgepole pine vegetation type

A patchwork of regenerating clearcuts was created with past harvest (see Table 30 above). Aside from this patchwork, lodgepole forests were homogenous and characterized by dense, mature trees with little age class diversity prior to the MPB epidemic. This homogenous forest type of mature lodgepole fed the MPB outbreak, which peaked in 2009, affecting over 74 percent of the lodgepole and ponderosa pine stands within the project area with intensities of greater than 90 percent mortality in some stands. Every pine stand that is larger than 5 inches in diameter has been affected by the mountain pine beetle epidemic in the project area (an estimated 23,541 acres of lodgepole pine and ponderosa pine with dead or dying trees over the majority of the stand). Stands assessed in 2014 contained few live mature lodgepole, and found that these forests have transitioned to the “gray phase”; that is, the needles have fallen. Walk-through surveys in the analysis area have found tree ages of all species range from 80-120 years. Under pure stands of lodgepole pine forested canopies, intermediate and understory trees are rare (mostly suppressed lodgepole pine and Douglas-fir seedlings and saplings) and average 50-70 years old. The MPB epidemic has increased within stand heterogeneity dramatically over pre-beetle stand conditions; however, from a landscape perspective the current condition of these forests are very homogeneous, a shift to a new paradigm of forested vegetation conditions.

Cool habitats dominated by lodgepole pine are common in the Tennmile – South Helena analysis area. Two habitat types represented the broader cool habitat types dominated by lodgepole pine: habitats where lodgepole pine was the climax species and occurred as pure stands prior to climax; and mixed conifer habitats where lodgepole pine was dominant in most stands. Fire disturbances historically characterized the mosaic of lodgepole pine age classes and stand successional that characterized mid to upper elevations in the Tennmile – South Helena area. Habitat types below 7,500 feet experienced more frequent fire than those above this elevation. At lower elevations fire perpetuated lodgepole pine by eliminating shade tolerant species from stands. Fischer and Clayton (1983) indicate that lodgepole pine-dominated areas occurred in patches ranging from five to hundreds of acres. Elevations above 7,500 feet fires under natural disturbance regimes were more infrequent, lightning-caused fires that burned with mixed fire severity; the result being a patch-mosaic of lodgepole pine size classes (Fisher and Bradley 1987).

Dense lodgepole pine stands dominated cool habitats prior to the MPB epidemic, and were one of the most common vegetation types in the Tennmile – South Helena area. Lodgepole will continue to be the dominant forest type in the near future when the pulse of lodgepole pine regeneration becomes established.

Mixed conifer vegetation type

In the project area, mid- to high elevation forests are currently homogeneous mature stands, lacking stand age diversity that comes from past fire disturbances that characterized a more heterogeneous project area. Blister rust and MPB have accelerated succession to subalpine fir and Engelmann spruce by killing mature whitebark pine, and MPB has killed the majority of lodgepole in the project area; this coupled with the lack of fire as a recycling agent has caused a major shift in landscape composition and structure from one of pine to fir and spruce (Keane 2000).

Whitebark pine is a foundation species of high elevation ecosystems, providing snow capture and retention, carbon storage, increasing biodiversity, and large calorie-rich seeds serving as a good food source for wildlife. Throughout its range whitebark pine is experiencing rapid mortality due to several factors including the exotic white pine blister rust, the native mountain pine beetle infestation, and wildfire exclusion resulting in interspecies competition, (GYCC 2011). Warming temperatures are thought to further increase the rate of mortality due to favorable conditions for mountain pine beetle, and potential moisture increases could favor the spread of white pine blister rust (GYCC 2011).

Within the Tenmile – South Helena project area, many of the mature whitebark trees have been killed by mountain pine beetle. An estimated 2,347 acres of scattered whitebark trees that occurs in mixed conifer (lodgepole pine, subalpine fir, Engelmann spruce and Douglas-fir) stands have been killed by MPB. There is a strong relationship between rates of whitebark pine killed by MPB and whitebark pine regeneration density indicating that stand-scale gap-phase⁹ dynamics may be one response to MPB outbreaks (Larson and Kipfmüller 2010). Although project area specific surveys have not been done in whitebark pine, informal field surveys have found whitebark regeneration established under more pure whitebark pine stands with a high component of dead mature trees; though some mature whitebark pine trees persist in the face of both beetle and blister rust pressure. Whitebark pine occurs most commonly at the highest elevations in the project area, with a few scattered individuals or in smaller (1/4 acre-sized) patches down to the mid-elevations.

Ongoing successional replacement of whitebark pine with the absence of fire may actually be enhanced by blister rust and mountain pine beetle kill; this is especially true where fire exclusion reduces the opportunity for whitebark regeneration. Morgan et al (1994) found that other conifers replace whitebark pine, in the absence of fire.

Arno (1989) reported that wildfire is an important process for whitebark pine with fire return intervals from 50 to 300 years in the Northern Rockies, with fires being highly variable in severity and size. Not all ecosystems or all Rocky Mountain landscapes have experienced the impacts of fire exclusion as yet; the lack of impacts may not yet be manifested at the stand level, but are detectable at the landscape level (Keane et al 2002).

⁹ Gap-phase' dynamics is defined as where the patchy mortality of mountain pine beetle outbreaks creates numerous forest openings and canopy gaps of varying sizes, which then allows for natural regeneration to become established (Larsen and Kipfmüller 2010).

Whitebark pine survives low intensity fires but still benefits from stand replacing fire where regeneration is most successful. Keane and Arno (1993) suggest that fire is important in perpetuating an abundance of whitebark pine.

Whitebark pine was designated in 2011 as a sensitive species in the Northern Region and is addressed in the Sensitive Plant section.

Forested Vegetation, Environmental Consequences

Introduction

This analysis will consider the projected trends for ponderosa pine-Douglas-fir and lodgepole pine vegetative communities with the absence of treatment (no action) and with the different treatments proposed with the action alternatives. FVS¹⁰ modeling was used to estimate the 50 year trend for these stands.

Table 31. Resource Indicators used to measure difference between alternatives

Resource Indicator(s)	Qualitative Unit of Measure	Quantitative Unit of Measure
MPB-impacted forest regenerated	None	Measured by acres of regenerated lodgepole and ponderosa pine forest
Resilience within forested stands	None	Measured by acres of age class diversity Measured by acres of species diversity Measured by acres of stand density diversity
Landscape heterogeneity	Measured by a qualitative discussion of landscape-level resiliency with patch-mosaic differences between the alternatives	None

The Helena National Forest (HNF) Plan (1986) provides guidance for public lands on the HNF. Forest-wide objectives with regard to the timber resource include:

- Management activities will increase timber productivity on suitable timber land.
- The sale program depends on managing suitable acres with stocking control techniques, such as pre-commercial and commercial thinning, and...managing insect or disease outbreaks.
- Timber management activities and projects will be coordinated with other resources through an interdisciplinary process.
- Provide a sustained timber yield that is responsive to local industry and national needs.

¹⁰ FVS (Forest Vegetation Simulator) Variant is an individual-tree, distance independent, growth and yield model based on the Stand Prognosis Model. The Eastern Montana Variant was used to model stands within the project area (see project file).

Proposed actions with the Tenmile – South Helena project are within twelve Forest Plan management areas (see Forest Plan Consistency section at the end of this analysis).

In addition to the above, Standards for Timber Management state that stand openings created by even-aged silvicultural systems will normally be 40 acres or less. Creation of larger openings will require a 60-day public review and Regional Forester approval. Exceptions are listed in the Northern Regional Guide. The two action alternatives include units that exceed 40 acres in size. The BLM will follow rules and regulation identified in 43 CFR part 5000.

Effects Common to All Alternatives

Climate change, fire, insect, and disease disturbances may occur and forested stands would progress through successional processes regardless of Alternative. Large proportions of the Project Area would remain untreated in all Alternatives. The MPB outbreak caused a large disturbance, potentially to a greater extent than would have been typical because of landscape homogeneity of age class. This event has diversified species composition and densities in many areas. At the landscape scale the age class has shifted but remains fairly homogeneous. In untreated areas, forests would slowly change over time through succession and other natural events. Dead and dying trees would eventually fall to the ground. Shade tolerant advance regeneration would likely persist and grow to dominate mixed sites where lodgepole has died. In openings and areas without shade tolerant species established, lodgepole natural regeneration may establish as serotinous cones open in the sun. As the fuel load changes from standing dead to a horizontal profile, the natural regeneration would have physical barriers, and coupled with the staggering in time of canopy gaps, create a variable height and age lodgepole pine stand, with scattered older trees of the few lodgepole pine trees not affected by MPB and other species of trees. Because the bulk of the landscape is dominated by small to medium sized trees, there would be a period with few old forests. Eventually if no disturbance enhances heterogeneity, this young landscape may again grow mature forests susceptible to large scale stand replacing disturbances over large areas.

Fire suppression is likely to continue with all Alternatives due to the proximity of the project area to structures and the risk to life and property, limiting the extent to which natural fire can restore the disturbance regimes of the area. All of the MPB-killed trees would remain onsite and are recruited to downed fuels over time. In time the dead trees would fall over in 5-15 years from when they are killed (Mitchell and Preisler 1998), resulting in large surface fuel accumulation. The MBP outbreak started in 2006 in the project area, with the peak in 2008 and 2009; beetle-killed trees have already started to fall over, with about 80 percent of the trees expected to be on the ground within the next 5 years. The resulting fuel accumulation would be variable, but is estimated to be between 40 and 80 tons per acre of 5 inch and larger material, with some areas exceeding 100 tons per acre of material. The extent of downed fuels expected in the near future in untreated areas would be continuous across a large area; this condition would be perpetuated on untreated areas on some proportion of the landscape regardless of Alternative. Elevated fuel loads would persist for more than a century, which could increase the extent and duration of wildfire events through prolonged smoldering and by serving as receptors for firebrands from adjacent stands (Collins et al 2012). If a severe wildfire were to occur after germination of the serotinous cone source, before the young

forests begin producing serotinous cones again, the seedbank could be lost within some stands and convert the area to grass/shrubland for the foreseeable future. Some of the surviving forests currently provide high cover and density; where untreated, these are susceptible to bark beetles and fire and may not persist until new old forests develop. Over time the patchwork of previously harvested areas would generally progress into the medium and potentially the large tree class, although growth may be slow in untreated areas due to high tree densities. Further, abundant subalpine fir that would likely regenerate in untreated beetle-killed stands is predicted to form a stratum of ladder fuels more likely to allow future fires to spread into the forest canopy (Collins et al 2012).

All the insects and diseases currently present on the landscape would remain in some amount, generally functioning at endemic levels. Some agents, notably the WSB, have been at outbreak levels and are likely to continue to cause damage. The MPB outbreak has by in large passed, and no Alternative would alter the levels of mortality that have occurred. The abundance and potential damage caused most agents would vary by Alternative within treated areas; however, no Alternative would remove them from the landscape and they would continue to function as part of the natural disturbance regime of the area.

Ongoing and Reasonably Foreseeable Actions

Reasonably foreseeable actions include those management activities that are on-going or planned to occur in the near future. These relevant activities to this forest vegetation analysis may occur regardless of which alternative is selected for implementation; these actions are considered in the analysis by alternative for this proposal.

Table 32. Ongoing and foreseeable activities relevant to forest vegetation analysis

Project/Activity Name	Decision Date and/or Status	Brief Description
Red Mountain Flume/Chessman Reservoir Project	Ongoing	Currently implementing fuel reduction project around Chessman Reservoir and the associated water flume infrastructure. Treatments are designed to reduce hazardous fuels around existing infrastructure. Approximately 500 total acres of fuels treatments and harvest are expected.
Timber Harvest Other non FS lands	Ongoing	Timber harvest may occur on private lands on unspecified acres, primarily tractor logging within the planning area
Weed Treatment on FS Lands	Ongoing	Herbicide treatment is primarily along roads and in patches that are accessible to mechanized equipment (spraying with ATVs) and/or by hand, biological (insects), goats/sheep, and aerial spraying. Treatment areas are identified in the EIS/ROD, continually updated, treated as new infestations are located.
Clancy Unionville Vegetation and Travel Management Project	Ongoing	Travel management, Forest vegetation improvements, Fuel treatments (non-activity fuels), Watershed improvements, Road improvements/construction, Road maintenance, Road decommissioning. Harvest activities have been completed, fuels treatments are ongoing.
Firewood Gathering	Ongoing	Personal firewood permits are issued for NFS lands. Dead trees may be cut which occurs mainly adjacent to roadways.
Tenmile Road Improvement (County Rd 695 - Rimini Road)	Foreseeable	Improve road way from the junction with Hwy 12 to the junction with the Chessman Reservoir intersection, just over 6 miles in length. Improvements would include replacement of three bridges and associated railings, bridge drainage improvements, upgrading road signs, re-alignment of road segments, and paving. Includes some tree removal.

Alternative 1, No Action

Direct/Indirect Effects and Cumulative Effects

The no action alternative provides the resource specialist a means for evaluating the current ecosystem conditions as a baseline. Under the No Action Alternative, current management plans would continue to guide management of the project area. New actions proposed with the Tenmile – South Helena project would not occur. Reducing intensity of wildfires and increasing fire suppression effectiveness for surrounding communities and key municipal watershed infrastructure would not take place. The specific actions proposed in the Action Alternatives to achieve the purpose and need for the project would not occur; these actions include creating a mosaic of vegetation and fuel structures through prescribed fire and commercial harvest of principally dead and dying trees. Because these actions would not occur, the fuel loading on the forest floor would continue to increase as dead trees killed by the mountain pine beetle epidemic continue to fall. The existing and increasing difficulties with fire suppression associated with the current forest vegetation and fuel structure would remain, especially when compared to the actions proposed in Alternatives 2 and 3. The direct, indirect, and cumulative effects of no action would be the forest stand progression trending away from the desired future condition.

The current distribution of age classes, species mixes, and within-stand and across-landscape structural diversities would be maintained in the short term. Forests would develop as described for untreated areas in Effects Common to All Alternatives. MPB may advance succession toward stands of more shade tolerant species, provided fire does not intervene (Nigh et al 2008). The sustained homogeneity of age and size class and the extent of high amounts of downed woody fuels may result in conditions not resilient to landscape level disturbances. In the event of a severe wildfire, the seed source currently provided by MPB-killed trees in some areas could be lost. Existing high density forests could be replaced by fire or bark beetles. The likelihood of these interactions is highest with the No Action Alternative because it perpetuates the existing condition on the landscape.

Douglas-fir and ponderosa pine vegetation type – includes old growth

In absence of a stand-replacing fire event, Douglas-fir stands in the Tenmile – South Helena project area would continue to increase in density and canopy layering. Where the densest Douglas-fir stands occur, individual Douglas-fir and ponderosa pine may die (from competition or insects), continuing the current trend in the project area. When either of these two species dies by bark beetle, the tree attacked is usually one of the larger diameter trees within the stand of trees. The dead tree or groups of trees then create canopy gaps that provide opportunity for an increase in seedlings and sapling-sized trees to develop; usually the size of these openings favors Douglas-fir regeneration. As stands progress over time, canopy gap areas would begin to fill in as Douglas-fir regeneration is established and trees grow, resulting in a decline in other species such as the early seral ponderosa pine, aspen, shrubs, and other herbaceous vegetation. The density of trees within the project area would increase causing a decline in individual tree vigor.

In approximately 60 to 80 years, it is possible that some of the Douglas-fir stands may attain old growth characteristics. FVS indicates one stand (317-01-029) that is a non-old Douglas-fir/ponderosa pine stand (mature stand with large diameter trees) would not attain old growth characteristics in a 50 year period due to mortality from bark beetles (see the figure below).

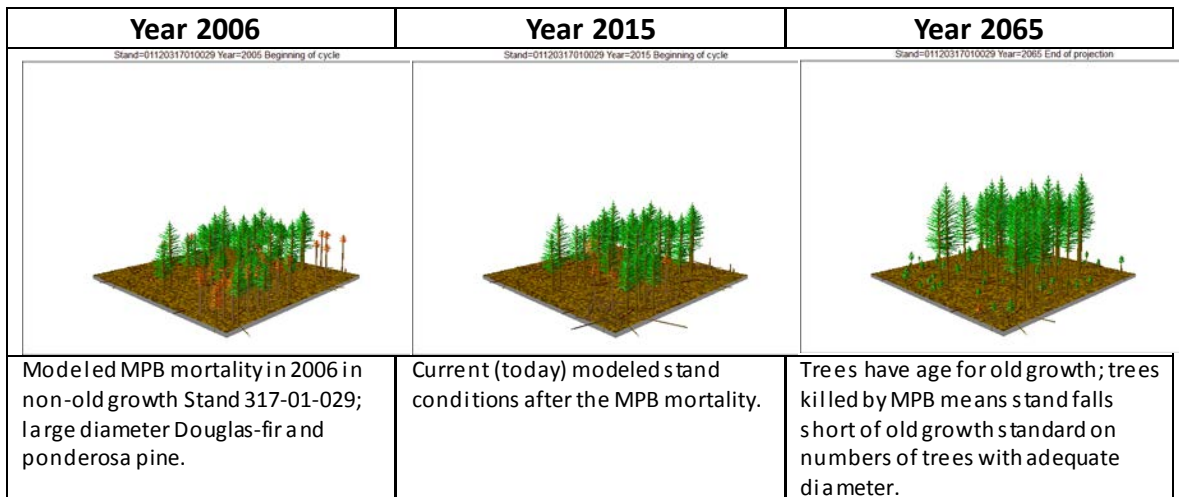


Figure 28. 50-year trajectory of FVS modeled non-old growth stand

Existing old growth may be reduced due to mortality to large trees from bark beetles, with large ponderosa pine trees potentially becoming scarce; 50 year trend modeling (with FVS) of one stand (315-01-086) that is currently old growth indicates a reduction of ponderosa pine, losing enough large trees to fall out of old growth status (see the figure below). The future trend due to beetle-caused tree mortality is for there to be fewer low elevation large diameter ponderosa pine, and therefore potentially less old growth in the project area. However, many existing low elevation old growth stands with a ponderosa pine component were field verified after the MPB epidemic, and most but not all stands have retained enough characteristics to remain old growth. There is a risk demonstrated with FVS modeling that these current stands may not be old growth in the future.

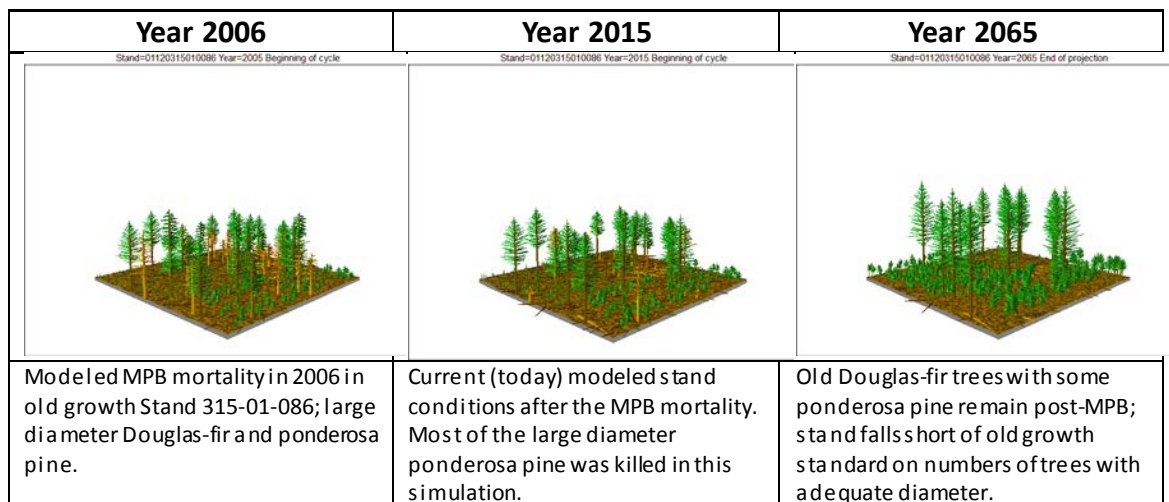


Figure 29. 50-Year trajectory of FVS modeled Douglas-fir and ponderosa pine old growth stand

Continued disruptions of the past mean fire interval would affect forest structure and composition. The lack of fire coupled with insect disturbances and individual stand dynamics continue to favor increasing densities and layering of Douglas-fir, and discriminate against the early seral species ponderosa pine. FVS modeling (see the figure below) shows that with one fire disturbance a multi-layered Douglas-fir/ponderosa pine/lodgepole pine stand becomes a more open-grown stand of large diameter trees.

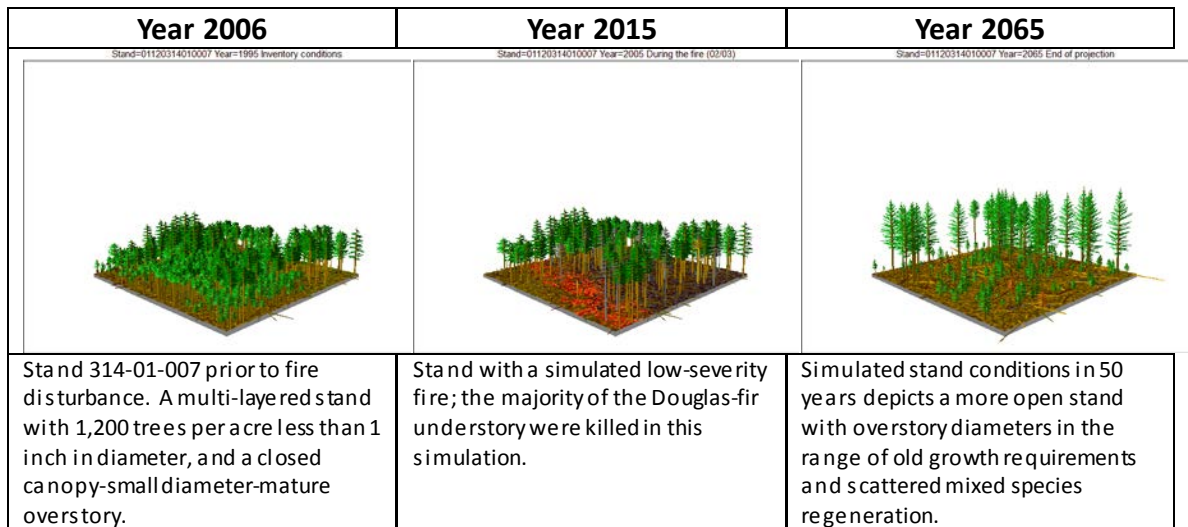


Figure 30. 50-year trajectory of FVS modeled mixed species Douglas-fir/ponderosa/lodgepole.

In the absence of natural or managed disturbance, an increase of understory Douglas-fir would occur, as is shown in the existing stand conditions within the lower elevations of the project area. With increasing Douglas-fir stand density and the multi-layering of Douglas-fir trees, both western spruce budworm and Douglas-fir beetle would continue to cause mortality, creating snags of varying sizes. An increase in mortality due to Douglas-fir beetle can currently be attributed to the heavy and repeated defoliation from spruce budworm, which then may lead to additional increases in beetle activity and large Douglas-fir tree mortality (as is evident from the current trend; see the figure below). An increase in other bark beetles (specifically MPB and western pine beetle) in ponderosa pine can be contributed to the sustained and increasing stand densities and associated loss in individual tree vigor due to competition from principally Douglas-fir. Dramatically higher stand densities and development of ladder fuels increase the risk of wildfire, bark beetle infestations, and in some areas, successional replacement by shade-tolerant competitors (Fiedler et al 2010). It is expected that with the no action alternative, mortality in large-diameter Douglas-fir and ponderosa pine would not only continue, but increase. The increase in mortality is expected in the analysis area given the current trend in local climatic conditions coupled with the current dense and multi-layered stand conditions common in the Tennile – South Helena area for the Douglas-fir and ponderosa pine vegetation community.

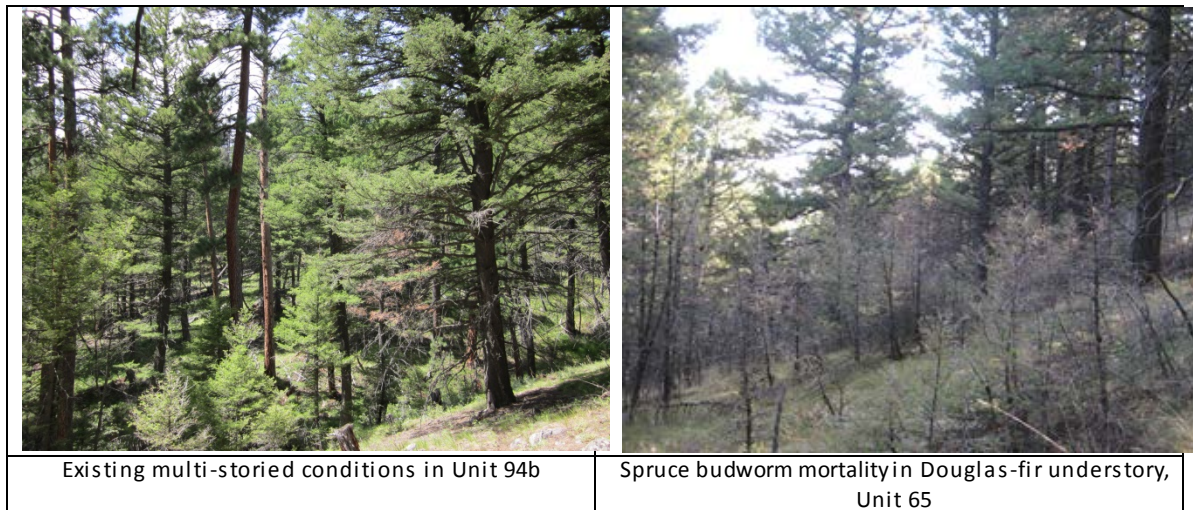


Figure 31. Multi-layered Douglas-fir and ponderosa pine stands.

Lodgepole pine vegetation type – includes old growth

Incidental mature lodgepole pine escaping attack by mountain pine beetle would grow vigorously; other species that occur in the stand (Douglas-fir, subalpine fir, Engelmann spruce and aspen) would also increase growth. Understory herbaceous vegetation (grasses, shrubs, and forbs) has thrived with the increased sunlight with the majority of the lodgepole pine overstory now dead. Natural regeneration has already begun in ‘canopy gap’ areas where enough warming sunlight has opened serotinous lodgepole pine cones. This natural regeneration would continue in the lodgepole pine type.

The dead trees have begun to fall over; fall rates are in 5-15 years (Mitchell and Preisler 1998) from the year the trees were killed (outbreak peaked in 2009). Over 80 percent of the dead trees will be on the ground within the next 5 years. These fallen dead trees will result in a large surface fuel accumulation. This fuel accumulation will be variable, but is estimated to be between 40 and 80 tons per acre of 5 inch and larger material, with some areas exceeding 100 tons per acre of material. Over decades, when there is a significant component of large down wood, there would be an increase in fire severity during high-intensity fire events (Jenkins et al. 2007). As the fuel load changes from standing dead to a horizontal profile, the natural regeneration would have physical barriers, and coupled with the staggering in time of canopy gaps, create a variable height and age lodgepole pine stand, with scattered older trees of the few lodgepole pine trees not affected by MPB and other species of trees. This progression with the lodgepole pine type is expected to occur on about 23,541 acres within the analysis area (see the figure below).



Figure 32. Existing staggered regeneration and beginning of downfall accumulation.

The extent of the bark beetle epidemic and lodgepole pine tree mortality in the Tennile – South Helena area will result in a profound change in the condition and arrangement of forest biomass (Kaufmann et al. 2008). Mortality due to the mountain pine beetle epidemic changes the fuel complex or characteristics in terms of fuel load and structure, microclimate and fuel moisture, and fire potential. These characteristics vary with the intensity of the beetle attack, initial stand conditions, and the time following the attack.

The 50 year trend for lodgepole pine vegetation type, as modeled with FVS (see the figure below), is for small (mean) diameter stands that would have some variability in size due to the regeneration being impeded by the horizontal profile of downed trees from the MPB epidemic. Trees that were mature at the time of the MPB epidemic respond to the available growing space in diameter and height; therefore some stands have highly varied vertical structure. The accumulated downfall of dead trees that occurred around the year 2015 to 2020 remains in the stand. The modeled stand (318-01-013) was an old growth stand prior to the MBP epidemic. Field surveys confirm that the stand is no longer old growth due to mortality to the older lodgepole pine component; FVS modeled the same result. Field surveys and photo interpretation have confirmed that most of the lodgepole pine –dominated old growth has fallen below old growth standards due to mortality from the MPB epidemic.

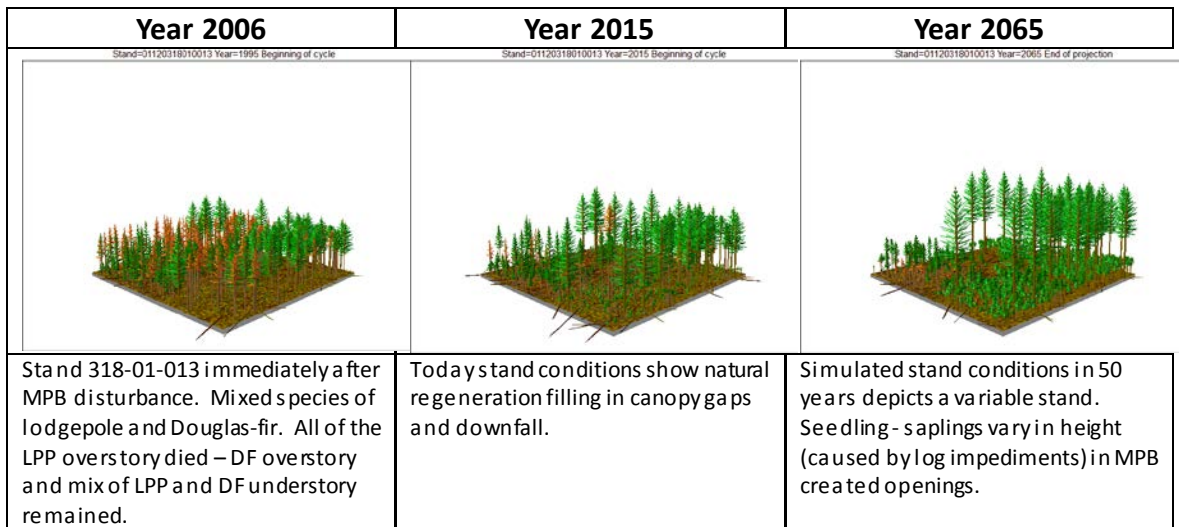


Figure 33. 50-year trajectory of FVS modeled lodgepole stand

Mixed conifer vegetation type – includes old growth

In the higher elevations of the forest within the project area, the MPB epidemic has killed whitebark pine (especially individual trees stressed from white pine blister rust) in addition to lodgepole pine. However, with whitebark pine occurring at higher elevations, the colder climatic conditions may prevent all of the mature whitebark pine trees from being killed; this is a different trajectory in the project area as compared to lodgepole pine. In addition, most whitebark pine occurs in mixed species stands within the project area. The resulting fuel profile associated with dying pine trees within the mixed conifer vegetation type is more complex than that described in the lodgepole pine type.

Accumulation of dead fuel would be in juxtaposition with live fuel, rather than the more straightforward accumulation of dead fuel loading with pure lodgepole pine stands. Fires that burn at higher elevations are known to have beneficial effects to whitebark pine with the potential for whitebark pine natural regeneration (Morgan et al 1994; Murray et al 2000; Keane 2000; Keane and Parsons 2010).

In more mixed conifer stands, the mortality from the MPB in both whitebark pine and lodgepole pine would favor the non-pine species. This is the case in most of the project area at the higher elevations of forest vegetation. Where more pure pockets of whitebark pine are killed by MPB, there may be enough of an opening to favor whitebark pine regeneration (stand-scale gap-phase dynamics may be one response to MPB outbreaks; Larson and Kipfmüller 2010). In more mixed conifer stands in the Tenmile – South Helena analysis area, blister rust and MPB have accelerated succession to subalpine fir or Engelmann spruce by killing mature whitebark pine, with a lack of adequate gap-size to allow whitebark pine natural regeneration to occur. It is anticipated that the stand dynamics in mixed conifer stands with blister rust and MPB-caused mortality to whitebark pine and MPB mortality to lodgepole pine, coupled with the lack of fire as a recycling agent, would cause a major shift in landscape composition and structure from one of pine to fir and spruce (Keane 2000).

The 50 year trend for the mixed conifer vegetation type, as modeled with FVS (see the figure below), is for the stand shift to primarily an Engelmann spruce-subalpine fir stand.

The regeneration that does become established is principally spruce-fir impeded by the horizontal profile of downed trees from the MPB epidemic. The majority of the lodgepole and the few whitebark pines are only left in trace amounts. The fuel profile trajectory created from the current MPB epidemic is projected by FVS to be relatively unchanged in 50 years. The modeled stand (319-03-049) was an old growth stand prior to the MPB outbreak and field surveys confirm that it still is an old growth stand, as depicted by FVS. All old growth stands that were mostly comprised of either Engelmann spruce or subalpine fir in the mixed conifer vegetation type remains as old growth; the majority of the stands comprised mostly of lodgepole pine or whitebark pine as an old growth component are no longer old growth.

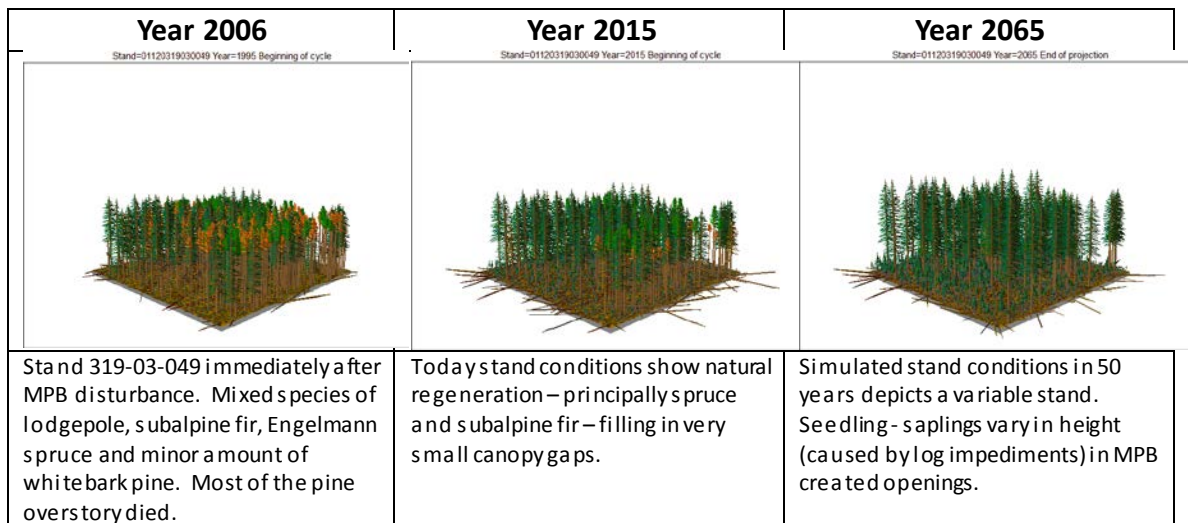


Figure 34. 50-year trajectory of FVS modeled mixed conifer stand.

Forest Carbon Cycling and Storage

The acreage of lodgepole pine forests currently affected by the MPB epidemic is extensive throughout the Tenmile – South Helena analysis area. As a major disturbance on the landscape, the bark beetle epidemic and associated large-scale lodgepole pine mortality is affecting overall forest structure, development, and forest carbon storage. Due to the amount of recent dead and dying trees, it is estimated that there would be a decrease in the net ecosystem productivity (NEP) with the No Action Alternative. This assumption is based on recent scientific literature on forest carbon storage which will be discussed more in this section.

These stands have been converted from a carbon sink to a carbon source to the atmosphere. Under the no action alternative, these areas would remain that way until the carbon uptake by new tree regeneration exceeds the emissions from decomposing dead organic material. Barring a large-scale fire, these stands would likely remain a carbon source for several years or longer depending on the amount of dead biomass left on the site, the length of time before new trees become re-established, and their rate of growth once trees start to grow. As new trees become established, the amount of carbon would accumulate rapidly for several decades. The net ecosystem productivity would increase until reaching an intermediate age, then gradually begin declining but remain positive until impacted by future disturbances (Law et al. 2003).

Recent scientific literature confirms some general patterns of forest carbon storage and release over the period of forest stand development and natural or induced disturbances. For large-scale context, our nations' forests have and continue to sequester vast amounts of carbon (nationally they are a net carbon sink, sequestering far more carbon than is released), equivalent to approximately 10 percent of annual carbon dioxide emissions from burning fossil fuels (Heath and Smith 2004; Birdsey et al. 2006). Law et al. (2003) looked at changes in carbon storage and fluxes for ponderosa pine stands in central Oregon. They evaluated the NEP, which is the balance between being a net carbon source and net carbon storage (referred to as carbon sink). Their evaluation concluded that NEP is lowest and negative (carbon source) in young stands (9 to 23 years), moderate in young stands (56 to 89 years), highest in mature stands (95 to 106 years), and low in old stands (190 to 360 years). Most mature and old stands remained a net sink of carbon. Pregitzer and Euskirchen (2004) synthesized results from 120 separate studies of carbon pools and carbon fluxes for boreal, temperate, and tropical biomes. They found that in temperate forests, NEP is lowest (more towards source) and most variable in young stands (0 to 30 years), highest (more towards carbon sink) in stands 31 to 70 years, and declines thereafter as stands age. These studies also reveal a general pattern of total carbon stocks declining after disturbance, increasing rapidly during intermediate years, and then declining over time until another significant disturbance (timber harvest or tree mortality resulting from drought, fire, insects, disease or other natural disturbances) kills large numbers of trees and again converts the stands to a carbon source. In this situation, carbon emissions from the decay of dead biomass exceed the amount of carbon removed from the atmosphere by photosynthesis within the stand. Over the long-term (centuries) net carbon storage is often zero if stands regenerate after disturbance because re-growth of trees recovers the carbon lost in the disturbance and in decomposition of trees killed by the disturbance (Kashian et al. 2006).

Because mountain pine beetles kill larger lodgepole pine and ponderosa pine trees preferentially, these dead trees represented proportionally larger values of carbon stocks (sequestration) and above-ground tree carbon production in killed trees within stands; more and larger trees killed results in greater decreases in carbon sequestration. Stand-level carbon can be recovered to pre-outbreak values in 25 years or less; it takes 50-160 years to recover to values shown in simulations where stands were not attacked. The size distribution of surviving trees can shorten this timeframe; a greater number of smaller trees store carbon at a greater rate through an amplified growth rate when compared to larger survivors, having a greater capacity to take advantage of increased resource availability (Pfeifer et al. 2010). Successful tree regeneration is a much more critical factor in recovering carbon than stand age class distribution or tree density. As long as post-disturbance lodgepole pine stands support enough trees to have the structural characteristics of forests rather than shrublands, grasslands, or other kinds of non-forest vegetation, they would recover pre-disturbance carbon stocks quickly and the landscape would be resistant to long-term changes in carbon storage (Ryan et al. 2008).

For the short term, onsite carbon stocks may remain higher under the No Action alternative than under the Action Alternatives. Nevertheless, caution is advised against interpreting carbon inventory maintenance or gains from deferred or foregone timber harvest in any specific forest or stand as affecting atmospheric concentrations of greenhouse gases. This only holds true if harvest does not occur elsewhere in the world

to supply the same world demand for timber (Gan and McCarl 2007; Murray 2008; Wear and Murray 2004). The result can be a net carbon impact if the timber is replaced in the marketplace with higher carbon source products such as steel or concrete or is harvested in a manner that does not result in prompt reforestation (Ryan et al. 2010; McKinley et al. 2011; Harmon 2009).

The risk of some high mortality disturbance events is greater under the No Action Alternative. The long-term ability of forests to persist as net carbon sinks is uncertain. Drought stress, forest fires, insect outbreaks and other disturbances may substantially reduce existing carbon stock (Galik and Jackson 2009). Climate change threatens to amplify risks to forest carbon stocks by increasing the frequency, size, and severity of these disturbances (Dale et al. 2001; Barton 2002; Breashears and Allen 2002; Westerling and Bryant 2008; Running 2006; Littell et al. 2009; Boisvenue and Running 2010). Recent research indicates that these risks may be particularly acute for forests of the Northern Rockies (Boisvenue and Running 2010). Increases in the severity of disturbances, combined with projected climatic changes, may limit post-disturbance forest regeneration, shift forests to non-forested vegetation, and possibly convert large areas from an existing carbon sink to a carbon source (Barton 2002; Savage and Mast 2005; Allen 2007; Strom and Fule 2007; Kurz et al. 2008a; Kurz et al. 2008b; Galik and Jackson 2009). Providing for prompt reforestation after disturbance ensures that forests become sinks again in the future and can speed carbon recovery. The No Action Alternative foregoes such climate change adaptation actions.

Response to Resource Indicators

Table 33. Alternative 1 response to resource indicators.

Resource Indicator(s)	Response
MPB-impacted forest regenerated	Intense MPB mortality favors regeneration of shade intolerant species (Axelson et al 2009). Alternative 1 does not affect the current regeneration trajectory in MPB-impacted forest types and does not assure regeneration on management areas designated for timber production. In the event of a severe wildfire, the seed source currently provided by MPB-killed trees in some areas could be lost.
Resilience within forested stands	Disturbance creates resiliency in forest stands by reducing density, and in some cases promoting species diversity. The MPB epidemic did create new stands with increased diversity; however even with the loss of mature pine trees and current reduction in density, the regenerated stands will have high densities in the future. Alternative 1 does not change the current trajectory of the project area; however, the MPB epidemic did increase resiliency of pine stands to beetles over pre- epidemic conditions. With 44% of the project area's forests being comprised of mid- to late seral dense stands of Douglas-fir, the probability of natural disturbances such as fire or insects affecting forests remains high. Most recent ADS data indicates widespread WSB defoliation, creating optimal conditions for bark beetle mortality and increasing vertical fuel loading for fires. Overall resiliency conditions of the project area remains low due to 51% of the project area's forests being comprised of dense stands (26,831 acres). The resiliency that occurs today would be reduced over time as stand density increases in the absence of disturbance.
Landscape heterogeneity	The analysis area went from a homogeneous landscape of mature forest to a homogeneous landscape of MPB killed forests; there is an estimated 23,541 acres of lodgepole pine and ponderosa pine with dead or dying trees over the majority of the stand. Within stand heterogeneity with species and age class diversity has improved within the MPB killed forests. Landscape heterogeneity has not improved, only a substantial acreage has been changed from one composition of species, size and age to another composition. A large portion of the analysis area remains unchanged; 44% of the project area is comprised of mid- to late seral dense stands of Douglas-fir. Landscape heterogeneity does not improve with Alternative 1, and remains relatively unchanged over a 50 year time period, unless future disturbance alters the trajectory by creating a patch mosaic of forested stands.

Irreversible/Irretrievable Commitments

The current homogeneity in forest structures, particularly the abundance and extent of downed fuels, may result in severe surface fire effects in the event of a wildfire. If such a fire occurs between the time seed from serotinous cones germinations and the trees again produce cones, there could be an irreversible loss of seed source and thereby long term loss of conifer cover in some areas. An irreversible effect could be a species composition shift toward shade tolerants (Douglas-fir, subalpine fir and Engelmann spruce) at the expense of lodgepole pine, aspen, and whitebark pine in some areas; however this loss would not likely be irretrievable in the event of future natural disturbances which would again favor seral species. The slower and more variable natural regeneration mechanisms may result in an irreversible loss of growth rates and future timber volume production and resiliency on timber management emphasis areas. With this Alternative, no economic recovery of trees killed by MPB would occur. As these trees fall over time they would have no economic value, at which point this foregone opportunity becomes irretrievable.

Action Alternatives

The action alternatives use similar types of vegetation treatments to meet the purpose and need for action. The acres and number of units are displayed below.

Table 34. Comparison of vegetation treatment acreages and number of units for alternatives 2 and 3 (FS and BLM lands).

Vegetation Treatment	Alternative 2		Alternative 3	
	Acres	Number of Units	Acres	Number of Units
Improvement Harvest	2,483	49	1,382	23
Clearcut with Leave Trees	3,573	41	2,348	19
Seed Tree with Leave Trees	298	3	0	0
Shelterwood with Leave Trees	363	4	102	2
Shaded Fuel Break	1,415	10	1,282	8
Low Severity Grassland Prescribed Fire	0	0	1,662	9
Low Severity Prescribed Fire	11,900	118	7,952	96
Mixed Severity Prescribed Fire	1,714	10	656	4
Private Land Buffers	2,091	45	2,283	46
Precommercial Thin	471	18	445	16
Total	24,308	298	18,112	223

There are two differences within the specific actions proposed by the two action alternatives: (1) alternative 2 does not have acres of ‘Low Severity Grassland Prescribed Fire’ and (2) alternative 3 does not have acres of ‘Seed Tree with Leave Trees’. Additionally, the two action alternatives differ by: (1) acres treated by treatment type; (2) location of treatment units; (3) specific treatment actions in Inventoried Roadless Areas; (4) the number of units; and (5) treatment intensities within the units. Even with these differences and different resource issues addressed between the action alternatives, the foundational design criterion was to have the purpose and need objectives met. The general prescription of each treatment type is described in the table below.

Table 35. General prescriptions of each specific action proposed by the action alternatives.

	Treatment Type	Specific Action	General Prescription
Commercial Treatments	Improvement Harvest	Improvement Cutting followed by jackpot or underburn	Thin from below and remove overstory trees (i.e., “crown thinning”) in order to reduce density from an average of 100-140 to 50-80 basal area, which would reduce crown fire potential. Substantial amounts of green, healthy large diameter trees would be retained in these dry or mixed forests. In some areas there currently are not enough green trees remaining to meet residual basal areas. Retain Forest Plan required snags.
	Regeneration Harvest	Clearcut with reserve trees followed by site prep burn	Cut dead and dying lodgepole pine. Retain all other live conifers when they occur; primarily Douglas-fir with spruce and subalpine fir. These units would naturally regenerate with lodgepole pine. Retain Forest Plan required snags.

	Treatment Type	Specific Action	General Prescription
		Seed tree with reserve trees followed by site prep burn	Cut dead and dying lodgepole pine. Retain 10-20 trees per acre of well-distributed healthy Douglas-fir and ponderosa pine to provide seed. Natural regeneration would be promoted, though ponderosa may be planted. Retain Forest Plan required snags.
		Shelterwood with reserve trees followed by site prep burn	A mix of dead lodgepole and other species would be cut. Retain about 20-50 trees per acre of healthy Douglas-fir to provide seed and shelter for seedlings. Natural regeneration would be promoted, though ponderosa may be planted. Retain Forest Plan required snags.
Prescribed Fire	Shaded Fuel Break	Pile burn, jackpot burn or underburn	A mix of dead trees and understory trees would be hand or mechanically cut to increase canopy spacing and to alter the fuel profile, creating a shaded fuel break of the live, larger trees available within the unit. Thin from below (i.e., “crown thinning”) in order to reduce density from an average of 100-140 to 50-80 basal area. Slash created would be handpiled and burned or jackpot burned where feasible to reduce surface fuel loadings. Shaded fuel breaks would vary in width depending on topography, aspect and slope, stand composition, and expected fire behavior adjacent to the fuel break.
	Low Severity Grassland Prescribed Fire	Jackpot or pile burn	Low intensity grassland prescribed burning would be used to improve grassland and grass-shrub areas. In these areas, encroaching conifers would be reduced. Mechanical and hand rearrangement of fuels would occur, with smaller diameter (less than 12 inch) trees strategically slashed or thinned, slash created from these treatments would be handpiled and burned or jackpot burned. No active ignition would occur in the open grasslands or adjacent timber stands, fire may spread into these areas exhibiting low intensity burn characteristics.
	Low Severity Prescribed Fire	Jackpot burn or underburn	Low intensity prescribed burning would be used to improve dry forests and grass-shrub areas. In forest areas, savannah conditions would be created with understory ladder fuels and crown fire potential reduced by the treatments. In non-forest areas, encroaching conifers would be reduced. Mechanical and hand rearrangement of fuels would occur, with smaller diameter (less than 12 inch) trees strategically slashed or thinned to facilitate prescribed burning.
	Mixed Severity Prescribed Fire	Broadcast burn	This larger scale “Landscape Ecosystem Burn” is a mosaic of prescribed fire types and intensities resulting in a strategic landscape mosaic of fire effects – about 40-60 percent of each unit would be burned. Mechanical rearrangement of fuels would be used in some areas to contain aerial ignition zones – which are principally dead lodgepole stands. These units are adjacent to strategic buffers comprised of shaded fuel breaks or low severity prescribed fire burns. The treatments are within roadless areas.

	Treatment Type	Specific Action	General Prescription
Non-Commercial Treatments	Private Land Buffers	Pile burn or jackpot burn	Reduce hazardous fuels on NFS Lands creating a buffer zone near private land that has structures. Develop opportunities for citizens who have completed fuels reduction or defensible space treatment on their property to extend treatments onto public lands where it meets land management objectives. Treatment includes a wide range of hand and mechanical activities to rearrange and remove hazardous fuels and reduce crown fire potential by thinning trees. Buffers in the <i>South Helena Portion</i> would extend up to 100 yards from private boundaries onto FS lands. Buffers in the <i>Tenmile Portion</i> would extend up to 200 yards from private boundaries onto FS lands.
	Precommercial Thin	Precommercial thin followed by pile and burn	Small diameter trees in past harvest units would be cut leaving about 100 - 200 trees per acre of the best-formed trees; this would enhance growth and vigor and reduce the long-term risk of mountain pine beetle caused mortality. The limbs and tops of the fallen trees may be lopped and scattered to speed decomposition. Hand or machine piling and burning of piles would be completed where the fuel loading is an unacceptable risk.

Effects Common to All Action Alternatives

The Action Alternatives create patches and patterns that to some extent emulate natural fire which has been excluded from this ecosystem for a century. Vegetation growth and succession are dynamic processes and can be reflected by changes in fire behavior over time. The restoration of fire adapted ecosystems does not involve simply the maintenance of open, late seral stands, but also increase large-scale heterogeneity by promoting a mosaic of conditions on the landscape on all forest types, including the upper elevations. Proposed treatments would promote resilience to disturbances by creating a mosaic of conditions in densities, species composition, and age class that differ from the No Action alternative and untreated areas within the action alternatives. The various proposed actions increase species diversity by providing seral species (ponderosa pine, lodgepole pine, whitebark pine and quaking aspen) growing space within a forested landscape that is now (post MPB epidemic) dominated by fir and spruce. Increasing landscape heterogeneity and increasing stand and forest resiliency with the Action Alternatives would help to ensure that not all forests are equally susceptible to the same disturbances at the same time.

All treatments include surface fuel and crown fuel reductions, and use a mix of: prescribed fire; mechanical or hand treatment and prescribed fire; or commercial harvest treatments and prescribed fire. Martinson and Omi found that these types of treatments moderate potential wildfire behavior in both long-needle and mixed conifer forests, with treatment effectiveness remaining for up to 10 years with longevity varying by ecosystem productivity (2013). They also found that where crown fire hazard has become too high as to preclude initial entry with prescribed fire, mechanical thinning may be a necessary precursor (ibid). Thinning treatments have demonstrated the greatest reductions in wildfire severity, but only those treatments that produce substantial changes to canopy fuels, shift diameter distribution towards larger trees, and are followed by broadcast burning or other means of removal (Martinson and Omi 2013).

All action alternatives would include treatments on some proportion of the landscape which would alter vegetation conditions. Post-disturbance conditions following harvest differ from those following most natural disturbances in terms of the types, levels, and patterns of structural legacies (Franklin et al 2002). Remnant trees have important influences on stand development (ibid); all harvest units retain remnant trees. Treatments would generally promote seral species composition (lodgepole pine, ponderosa pine and where it occurs, quaking aspen) over shade tolerant competitors (spruce and fir); these treatments would alter the behavior and severity of potential future wildfires (Collins et al 2012).

Harvesting would remove some of the biological legacies left behind after the MPB outbreak; in these areas, habitat conditions would be altered from the No Action alternative within the treatment areas. The loss of these habitat components would be ameliorated through the retention of untreated areas, retention of remnants within harvested areas, focusing harvest on forests with high pine composition, and avoiding riparian zones.

Commercial harvest would produce timber products generated from salvaging trees recently killed by the MPB epidemic; additionally, a smaller amount of green trees would be removed to achieve desired stand densities. In all harvest treatments, the largest trees are preferred for retaining after treatment, and the amount of trees kept on site vary by treatment (see Table 35 above on General Prescriptions). Commercial and pre-commercial treatments would alter the rate, vigor and composition of tree growth in suitable timber areas as compared to no action. Promoting individual tree growth and species diversity with an emphasis on seral species not only improves individual forest stand resilience, but when viewed across the project area as a summation of diverse treatments over a large area, increases landscape resilience.

All action alternatives would assure rapid reforestation to provide for timber productivity in the long term on some proportion of the landscape that generally favors fast growing seral species over slower growing shade tolerant species. Timely reforestation is assured within 5 years of regeneration harvest. Most of the proposed regeneration harvests would occur in stands dominated by lodgepole pine with high MPB-caused mortality, and would rely principally on natural regeneration for reforestation. In addition, some regeneration units would have planting (either Douglas-fir or ponderosa pine) in addition to natural regeneration to ensure species diversity. The success of regeneration would be monitored with stocking surveys.

Old Growth

The Action Alternatives avoid harvesting, burning or other treatments within designated old growth. Most old growth has been field verified to ensure the treatments avoid old growth and most units have been field verified to ensure that they do not include old growth. However, field surveys would continue for both Action Alternatives to identify old growth outside of the treatment units and to field verify that all acres within the proposed units avoid old growth. With all existing old growth protected through mitigation measures, no further analysis of old growth will occur.

Snags

For simplicity and to provide a conservative analysis, post-treatment estimates were made assuming all the snags are cut from all harvest units. Using ADS, the analysis subtracted beetle-killed snags within units from the total, and the remaining dead trees averaged for the watershed. The result was an average snags per acre estimate reflecting trees recently killed by bark beetles. Specific snag calculations by 3rd order drainage follows in each action alternative discussion.

Alternative 2, Proposed Action

The Proposed Action is designed to maximize the opportunity to meet the purpose and need of improving conditions for public and firefighter safety across the landscape in the event of a wildfire. Alternative 2 does this by proposing the largest number of acres treated (see

Table 36 below), thereby providing the greatest change in fuel structures and creating large-areas of vegetation mosaics.

Table 36. Alternative 2 proposed treatments.

Vegetation Treatment	Acres
Improvement Harvest	2,483
Clearcut with Leave Trees	3,573
Seed Tree with Leave Trees	298
Shelterwood with Leave Trees	363
Shaded Fuel Break	1,415
Low Severity Prescribed Fire	11,900
Mixed Severity Prescribed Fire	1,714
Private Land Buffers	2,091
Precommercial Thin	471
Total	24,308

Alternative 2 has 34 (2 BLM and 32 FS) units that exceed 40 acres in size (see Table 37 below). The regeneration harvest proposed to exceed 40 acres in size include: clearcut with reserve trees (30 units for a total of 3,491 acres); seed tree with reserve trees (two units totaling 280 acres); and shelterwood with reserve trees (two units totaling 129 acres).

Table 37. Regeneration harvest units that exceed 40 acres in size.

Unit	Acres	Unit	Acres	Unit	Acres	Unit	Acres
1	71	20	85	29	84	98g	68
3	78	21	101	30	92	98h	132
5	53	22	130	32	47	104	58
11	523	23	90	35	53	106a	260
15	70	24	77	36	193	106e	80
17	72	26	223	39c	43	110b	86
18	134	27a	42	97a	226	118	168
19	169	27b	54	98c	57	130	46
BLM 142a	49	BLM 143a	184	-	-	-	-
Average (small, large): 115 (42, 523)							








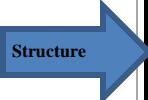

There are two past regeneration harvest units from the Clancy Unionville Timber sale that are adjacent to the Alternative 2 regeneration units that are still considered an opening, and when added to the new proposed units exceed 40 acres in size. Unit 21 (101 acres) is adjacent to a 7 acre clearcut that was harvested in 2012; the sum total of the two openings is 108 acres. Unit 118 (168 acres) is adjacent to a 20 acre clearcut that was harvested in 2010; the sum total of the two openings is 188 acres. The units that exceed 40 acres were designed to encompass past fire and insect disturbance patterns that created a patch mosaic of stands. The large units proposed for treatment are an indication of the variability in size and shape of these past disturbances. Large patch sizes that comprise the units that exceed 40 acres provide the structure and arrangement of conifer forests that naturally occur within landscape that is the Tenmile – South Helena project area.



Direct/Indirect Effects

Douglas-fir and ponderosa pine vegetation type

A majority of the proposed treatments (63 percent) with alternative 2 are in the Douglas-fir and ponderosa pine vegetation type. Alternative 2 directly affects the existing condition of the lower elevations by changing stand densities and composition of species. There are five different types of treatment proposed in this vegetation type (see figure below).

Table 38. Treatments in Douglas-fir and ponderosa pine vegetation type.

Proposed Action	Example of existing stand conditions	General changes in forest vegetation conditions with prescribed treatment	Example of desired post-treatment conditions	Acres
Improvement Harvest		These units have variable densities (from 100 to 240, with an average of 100-140 basal area) and vary in species composition (Douglas-fir, ponderosa pine with few lodgepole and quaking aspen). Improvement Harvest would thin from below and remove overstory trees (i.e., “crown thinning”) in order to reduce density to 50-80 basal area, which would reduce crown fire potential. Substantial amounts of green, healthy large diameter trees would be retained in these mixed forests. In some areas MPB has created areas where there would not be enough green trees remaining to meet prescribed residual basal areas.		2,483
Shelterwood with Leave Trees		A mix of species comprises these units – Douglas-fir, ponderosa pine and lodgepole – at an average of 100 to 140 basal area (with wide variation). Most of the lodgepole is dead. The treatment objective is to regenerate these units, with post-harvest retention of 20-50 trees per acre of healthy Douglas-fir and ponderosa pine to provide seed and shelter for seedlings. Natural regeneration would be promoted, though ponderosa may be planted.		363
Low Severity Prescribed Fire		A mix of open grassland, scattered trees, and dry mixed conifer forests (comprised principally of Douglas-fir and ponderosa pine) characterize these units. What exists are dead and live trees, and tree encroachment into grasslands. A low intensity prescribed burning would be used to create savannah conditions in forests with understory ladder fuels and crown fire potential reduced with low intensity fire. In non-forest areas, most of the encroaching conifers would be killed with fire. Mechanical and hand rearrangement of fuels would occur, with smaller diameter (less than 12 inch) trees strategically slashed or thinned to facilitate prescribed burning.		11,900
Private Land Buffers	 	These units are comprised of Douglas-fir, ponderosa pine and some lodgepole pine at varying densities and tree size; ranging from 100 to 240 basal area and from seedling to large diameter trees. These units would create a buffer zone near private land that has structures. A wide range of hand and mechanical activities to rearrange and remove hazardous fuels and reduce crown fire potential by thinning trees is proposed, and would be done in conjunction and coordination with adjacent landowner.		655

Proposed Action	Example of existing stand conditions	General changes in forest vegetation conditions with prescribed treatment	Example of desired post-treatment conditions	Acres
Precommercial Thin		Old harvest units with small (sapling- to pole-sized) trees with current densities from about 500 to 1000 trees per acre (average is around 800) of Douglas-fir and ponderosa pine. These units would have the majority of the trees cut, leaving about 100 - 200 trees per acre of the best-formed trees; this would enhance growth and vigor and reduce the long-term risk of mountain pine beetle caused mortality. The limbs and tops of the fallen trees may be lopped and scattered to speed decomposition. Hand or machine piling and burning of piles would be completed where the fuel loading is an unacceptable risk.		379
Total acres of vegetation treatments in Douglas-fir and ponderosa pine vegetation type				15,780

Improvement Harvest

The proposed stand improvement treatments would reduce existing stand densities from an average of 100 to 140 basal area (with some stands exceeding 200 basal area) to a post-treatment density of 50 to 80 basal area. (Basal area is a measurement of stand density, where a given area of trees is described by the cross-section [in square feet] of those trees.) Through prescriptive harvest actions, larger diameter and healthy green trees would be retained in this vegetation type; variability is retained in the stand with MPB mortality and the basal area retention objectives. The focus of the treatment would be the removal of dead and dying trees as well as smaller diameter green trees; however, the overstory (sawlog-sized) trees would be thinned as well. In these harvest units, all snags > 20" dbh would be retained along with additional smaller snags to average at least 2 snags per acre of the largest, most windfirm snags available (meeting Forest Plan standards). There would also be live trees in various size classes to provide snag replacement and inoperable inclusions where all snags would be retained. The direct effect of the action would be to reduce crown fire potential and increase stand resiliency to future disturbances.

Additionally, the proposed prescription would remove most of the smaller trees (less than 4 inches in diameter), principally through an understory burn after the proposed thin. Although basal area is the measure used for density in this analysis, the less than 4 inch size trees can account for a high level of tree stocking on an individual stand basis and not amount to much basal area. An example of this is in Unit 175, where 330 trees per acre with an average diameter of less than 3 inches account for less than 8 square feet of basal area of the total basal area for the stand.

The proposal would convert dense (high basal area) and multi-storied stands (with layering of different aged trees) into open-grown, variably-spaced trees. The resultant post-treatment stand structure would be similar to what would have been created with a frequent-fire-interval disturbance regime described in the existing condition of this analysis. Treatments that approximate desired conditions create relatively open, large-tree dominated structures primarily composed of seral species (Feidler et al 2010). Poor growth, high stand densities and the amount of Douglas-fir are correlated to infestation levels of Douglas-fir beetle (Fettig et al 2007). Slow growth and tree competition (with a reduction in tree vigor with increases of stand density) are also correlated to MPB levels in ponderosa pine, with thinning to reduce tree competition and increase individual tree growth potentially being critical for long term prevention of mountain pine beetle outbreaks in ponderosa pine (Fettig et al 2007).

Post-harvest conditions would find variably spaced large trees with smaller trees scarce or occurring as clumps in openings within the tree canopy. Shrubs and forbs would be common, but low growing. Surface fuels would be at 12 to 15 tons per acre. Species composition would favor ponderosa pine, although Douglas-fir is common with other species present such as aspen. Aspen clones would be provided adequate growing space where they occur, with conifers less than removed within and adjacent to the clone.

The direct effect for the 2,483 (2,071 FS and 412 BLM) acres of improvement harvest would be the removal of about 20 to 160 square feet of basal area of principally Douglas-

fir (with salvage of dead lodgepole in some units) and removal of most of the smaller diameter understory. The indirect effect would be to improve growing conditions for the remaining trees, thereby increasing resiliency. In addition, a direct effect would be the removal of conifer competition to upland aspen clones, which would indirectly improve growing conditions for aspen and creating the opportunity for seedlings to develop into large trees.

The 50 year trend for the improvement harvest stands would be large, open-grown ponderosa pine and Douglas-fir stands that are resilient to inherent disturbance regimes (insects and fire) as is described in the Desired Condition section of this analysis. FVS modeling of an improvement harvest and followed by a prescribed burn (see project file for FVS outputs) shows that in 50 years there would be widely spaced trees (up to 30+ inches in diameter with basal area ranging from 40 to 100 square feet per acre). An increase of ponderosa pine resulting from the proposed treatments is shown with FVS modeling. If the non-old growth stands meet age requirements per Green et al in 50 years, these stands would be classified as old growth, as FVS modeling indicates they would meet the structural definitions. Mean diameters for these stands would more than double, which means that smaller trees are not common or if present, occur in openings within the tree canopy, and that there are larger diameter trees than without treatment. Shrubs and forbs are common, but are low growing. Species composition favors ponderosa pine, although Douglas-fir is common with other species present such as aspen. Aspen clones are provided adequate growing space where they occur, and are a healthy component of these thinned stands in 50 years. Without additional future disturbances that are similar to the natural fire intervals of the past, the stand would revert back to the stand conditions described in the no action alternative.

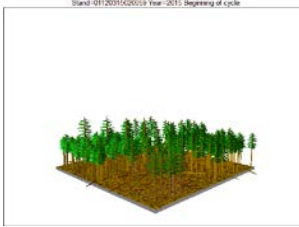


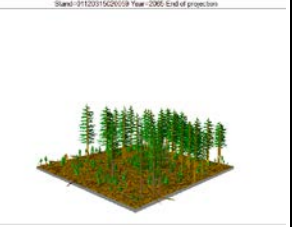
Year 2015	Year 2015 –Treatment in Unit 51		Year 2065
Stand: 011201502059 Year: 2015 Beginning of cycle	Stand: 011201502059 Year: 2015 Post Logging	Stand: 011201502059 Year: 2015 During the fire 62/53	Stand: 011201502059 Year: 2065 End of projection
			
Stand 315-02-059 in Unit 51 prior to treatment – existing condition with bug-killed fuel loading and predicted dominance by Douglas-fir in future.	Improvement harvest followed by understory burn in Stand 315-02-059 within Unit 51.		Simulated stand conditions in 50 years depicts a variable stand dominated by large diameter ponderosa pine and Douglas-fir – with future structure that meets old growth requirements.

Figure 35. FVS modeled improvement harvest in Douglas-fir and ponderosa pine vegetation Type.

Shelterwood Harvest with Leave Trees

The proposed prescription for the 363 (130 FS and 233 BLM) acres of shelterwood harvest with leave trees is to retain healthy ponderosa pine and Douglas-fir seed and shelter trees at about 20 to 50 trees per acre. Roughly 20 snags per 10 acres from a mixture of diameter classes (with seral species preferred) would be retained where they do not pose a safety or feasibility concern; and all snags >20" dbh would be retained.

Natural regeneration would be promoted, though ponderosa pine seedlings may be planted after the harvest has been completed to promote species diversity.

The shelterwood harvest would create an early seral component (begin stand initiation phase) of ponderosa pine and Douglas-fir leaving large diameter ponderosa pine and Douglas-fir as seed trees. The shelterwood harvest would remove much of the understory; light underburning would remove the remaining ladder fuels not removed with harvest. Collectively, this would reduce stand density to between 20 and 60 square feet of basal area, which would lower the hazard for bark beetles on the remaining ponderosa pine. Not all of these stands are a pure ponderosa pine - Douglas-fir type; some stands contain a component of bark beetle infected lodgepole pine which would be a salvage component within the shelterwood harvest. The final action in these units would be promoting natural regeneration and may include planting ponderosa pine seedlings to increase the pine component over the long term of these units.

Post seed tree harvest conditions would find variably spaced large trees with about 200 to 400 Douglas-fir and ponderosa pine seedlings per acre. Shrubs and forbs would be common, but low growing. Surface fuels would be at 12 to 15 tons per acre. Aspen clones, where they exist, would be provided adequate growing space where they occur, with conifers removed within and adjacent to the clone.

All trees less than sawlog size would be removed and brought to a landing for disposal (either as biomass, firewood, or other product). The direct effect would be the removal of about 0 to 200 square feet of basal area of principally Douglas-fir (with salvage of dead lodgepole in some units) with about 20 to 60 BA retained (20 to 50 trees per acre). An additional direct effect would be a change in species composition with ponderosa pine increasing in numbers, along with a reduction in Douglas-fir. The indirect effect would be to improve growing conditions for the remaining trees, and creating optimal growing conditions for ponderosa pine and Douglas-fir. In addition, a direct effect would be the removal of conifer competition to upland aspen clones, which would indirectly improve growing conditions for aspen and creating the opportunity for seedlings to develop into large trees.

The 50 year trend for the shelterwood harvest would be large, open-grown ponderosa pine and Douglas-fir stands that are resilient to inherent disturbance regimes (insects and fire) as is described in the Desired Condition section of this analysis. FVS modeling (see project file for FVS outputs) shows that in 50 years there would be variably-spaced large Douglas-fir and ponderosa pine trees, residual from the harvest (over 30 inches in diameter with basal area ranging from 40 to 80 square feet per acre). The early seral ponderosa pine and Douglas-fir would be growing vigorously. Shrubs and forbs are common, but are low growing. Species composition in 50 years would be mostly ponderosa pine with Douglas-fir, aspen and lodgepole pine. Aspen clones are provided adequate growing space where they occur, and are a healthy component of these harvested stands in 50 years.



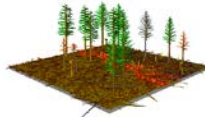

Year 2015	Year 2015 –Treatment in Unit 39c		Year 2065
			
Unit 39c prior to treatment – existing condition with bug-killed fuel loading.	Shelterwood harvest followed by understory burn within Unit 39c.		Simulated stand conditions in 50 years depicts a two-aged stand of large diameter ponderosa pine and Douglas-fir with an understory of ponderosa pine and Douglas-fir.

Figure 36. FVS Modeled shelterwood with leave trees in Douglas-fir and ponderosa pine vegetation type.

Low Severity Prescribed Fire

The proposal is to use ignited fire to prescribe burn 11,900 (11,527 FS and 373 BLM) acres of open grassland, scattered trees, and dry mixed conifer forests (comprised principally of Douglas-fir and ponderosa pine). A low intensity prescribed burning would be used to create savannah conditions in forests with understory ladder fuels and reduce crown fire potential with low intensity fire. In non-forest areas, most of the encroaching conifers would be killed with fire. Mechanical and hand rearrangement of fuels would occur, with smaller diameter (less than 12 inch) trees strategically slashed or thinned to facilitate prescribed burning.

Treatments in low elevation, dry forests-grasslands that approximate desired conditions (as described in the Desired Condition section) tend to create relatively open, large-tree dominated structures primarily composed of seral species; these treatments induce ponderosa pine regeneration, reduce tree density and expedite reintroduction of fire (Fiedler et al 2010). Prescribed burning in low severity units with this proposal would return the fire as a disturbance process to the Tennile – South Helena project area, and are designed to be low-intensity with fire ignited over the entire unit, reducing multi-layering understory trees and overall forest density in forested stands, and reduce conifer encroachment in dry grasslands. This action would allow for the ability to improve resiliency, resulting in stands more able to withstand bark beetle mortality and stand-replacing fire (Agee and Skinner 2005; Fettig et al 2008).

Prescribed fire would use hand-lighting with some hand-falling of trees to occur in order to facilitate burning objectives. Burning would occur when weather and ground conditions are suitable to maintain air quality and burning can be controlled; this timing may be in spring or fall. Ignitions may occur over multiple years.

Overtime, fire as a disturbance would need to be continued as a management tool, as the Douglas-fir – ponderosa pine vegetation type in the project area historically experienced fires on frequent intervals. Long-term resilience would be improved with these disturbances; without additional future disturbances that are similar to the natural fire intervals of the past, these forest types would revert back to the conditions described in the no action alternative.

The direct result from the low severity prescribed fires would be the burning of the grass, herb and shrub understory communities (that fueled the understory burned), along with the killing of seedling and sapling sized conifers in the understory. A few overstory trees (less than 5 percent) may also be killed from the understory burning. Spring burning would have more of an impact on the overstory trees, as the tree buds would be more susceptible to heat. Fall burning would be less of an impact as the tree buds would be hardened, and more able to withstand heat generated from burning. The indirect effect of the low severity prescribed fire would be a re-growth of senesced grass, herb and shrub understory communities (that fueled the understory burn), an additional <10 percent of overstory tree mortality due to secondary effects of the prescribed fire (mainly beetle), an increased vigor for the remaining conifers, and natural regeneration of ponderosa pine. FVS modeling (see project file for FVS outputs) indicates that in 50 years understory burning would result in less dense stands with larger mean diameters, and a higher amount of ponderosa pine where it is present than compared to stands that had no burning (see no action alternative discussion).

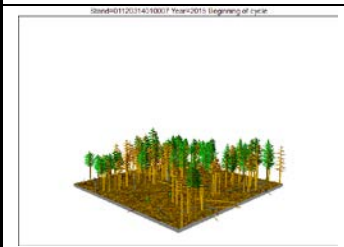

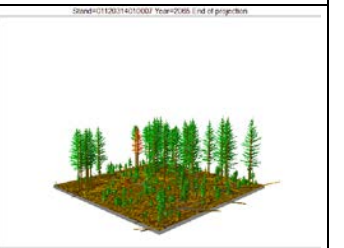
Year 2015	Year 2015 –Treatment in Unit 53	Year 2065
		
Unit 53 (stand 314-01-007) prior to treatment – existing condition with bug-killed fuel loading.	Low intensity prescribed burn within Unit 53.	Simulated stand conditions in 50 years depicts an open, two-aged stand of large diameter ponderosa pine and Douglas-fir with an understory of ponderosa pine and Douglas-fir.

Figure 37. FVS modeled low severity prescribed burn in Douglas-fir and ponderosa pine vegetation type.

Private Land Buffers

The objective with the 655 acres (all on FS lands) of private land buffer treatment in the Douglas-fir and ponderosa pine vegetation type is focused on enhancing the fire suppression efforts by reducing hazardous fuels on public land to provide a measure of protection to existing infrastructure within the Tennile – South Helena project area. This narrow objective would result in a similar effect to forest vegetation as is described in the improvement harvest discussion above. These units are comprised of Douglas-fir, ponderosa pine and some lodgepole pine at varying densities and tree size; ranging from 100 to 240 basal area and from seedling to large diameter trees. These units would create a buffer zone near private land that has structures. A wide range of hand and mechanical activities to rearrange and remove hazardous fuels and reduce crown fire potential by thinning trees is proposed, and would be done in conjunction and coordination with adjacent landowner. A more detail discussion on the effectiveness of this treatment can be found in the Fuels analysis. However, the direct, indirect and projected development of these treatments in the lower elevation Douglas-fir and ponderosa pine vegetation type are the same as discussed in the improvement harvest portion of this analysis.

Precommercial Thin

Precommercial thins (non-commercial) would be used to treat naturally regenerated and planted trees in previously harvested stands over 379 acres (all on FS lands). Whitbark pine, ponderosa pine, Douglas-fir and then lodgepole pine (in order of preference) would be retained to enhance species diversity thereby improving long-term resiliency of these stands. Trees would be thinned to a 15-foot to 20-foot spacing (100 to 200 trees per acre). The limbs and tops of the fallen trees may be lopped and scattered to speed decomposition. Hand or machine piling and burning of piles would be completed where the fuel loading is an unacceptable risk.

Old harvest units with small (sapling- to pole-sized) trees with current densities from about 500 to 1000 trees per acre (average is around 800) of Douglas-fir and ponderosa pine are currently on a trajectory to becoming dense stands that would be susceptible to a long-term risk of mountain pine beetle caused mortality.







The objective of the thinning in old harvest units (from the 1960s through the 1970s) is to increase growth and improve resiliency by reducing stand density with the proposed treatment. The best tree (defined as free-growing and full crowned) would be retained. These old harvest areas are principally Douglas-fir and ponderosa pine (with some lodgepole pine) sapling- to pole-sized stands,




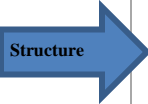




The direct effect would be the cutting down about 0 to 800 trees per acre, retaining about 100 to 200 trees per acre. The indirect effect would be to improve growing conditions for the remaining trees, thereby increasing resiliency. FVS modeling to project 50 year condition for these stands was not possible, as stand examination data was not available for these young stands. However, modeling similar tree species composition in open-grown stand conditions (the regeneration harvest treatments of shelterwood and seed tree) indicate that these stands would become mid-seral sized (small sawtimber) stands of trees within the projection period.

Lodgepole pine and mixed conifer vegetation types

About a quarter of the proposed treatments (25 percent) with alternative 2 are in the lodgepole pine vegetation type and the remaining (12%) are in the mixed conifer vegetation type. The mixed conifer vegetation type is included in the lodgepole pine type due to the proximity of the treatments, and that mixed conifer stands include high percentages of lodgepole pine. The difference is the amount of other conifer species can account for a third or more of the stands dominated by lodgepole. Alternative 2 directly affects the existing condition of the mid- to higher elevations by creating a patch mosaic of early seral trees that are projected to grow at much faster rates than untreated forests in this same vegetation type. There are six different types of treatment proposed in these two vegetation types (see Table 39).

Table 39. Treatments in lodgepole pine and mixed conifer vegetation types.

Proposed Action	Example of existing stand conditions	General changes in forest vegetation conditions with prescribed treatment	Example of post-treatment conditions	Acres
Clearcut with Leave Trees		The majority of the trees in this treatment type are dead lodgepole pine. All units have a mix of other species – Douglas-fir, subalpine fir, spruce and aspen. The amount of live trees is variable. The treatment would cut dead and dying lodgepole pine and retain all other live conifers when they occur. These units will naturally regenerate with lodgepole pine. Retain Forest Plan required snags would be left in clumps, with preferred location nearby live trees.		3,573
Seed Tree with Leave Trees		The majority of these stands are comprised of dead lodgepole pine which would be removed. These units are different from clearcut in that there are more evenly distributed green trees to retain. There would be about 10-20 trees per acre of well-distributed healthy Douglas-fir and in some areas ponderosa pine to provide seed. Natural regeneration would be promoted, though ponderosa may be planted.		298
Shaded Fuel Break		A mix of dead trees and understory trees will be hand or mechanically cut to increase canopy spacing and to alter the fuel profile, creating a shaded fuel break of the live, larger trees available within the unit. Thin from below (i.e., “crown thinning”) in order to reduce density from an average of 100-140 to 50-80 basal area. Slash created would be handpiled and burned or jackpot burned where feasible to reduce surface fuel loadings. Shaded fuel breaks would vary in width depending on topography, aspect and slope, stand composition, and expected fire behavior adjacent to the fuel break.		1,415

Proposed Action	Example of existing stand conditions	General changes in forest vegetation conditions with prescribed treatment	Example of post-treatment conditions	Acres
Mixed Severity Prescribed Fire		These mid- to higher elevation treatment units are a mix of species, though the targeted areas to burn are the dead lodgepole pine patches that vary in an estimated size from 5 to 50 acres. The example condition on the right is an opening created from a wildfire, and depicts a much larger patch than is targeted with this proposal. However, a mosaic of small patches of openings created from fire that are 5 to 20 acres in size are proposed.		1,714
Private Land Buffers	 	These units are mostly lodgepole pine that is mostly dead, with some other species such as Douglas-fir, subalpine fir and spruce. There are varying densities and tree size; ranging from 0 to 160 basal area and from seedling to large diameter trees. These units would create a buffer zone as described in the Douglas-fir and ponderosa pine discussion above.	 	1,436
Precommercial Thin		These are old harvest units with small (sapling- to pole-sized) principally lodgepole pine trees with current densities from about 500 to 1000 trees per acre (average is around 800). These units would be treated as discussed above in the Douglas-fir and ponderosa pine section.		92
Total acres of vegetation treatments in lodgepole pine and mixed conifer vegetation types				8,528

Clearcut with leave trees

The proposed prescription for the 3,573 (all on FS lands) acres of dead and dying lodgepole is to conduct a clearcut harvest of the dead and dying lodgepole pine trees, retaining all other species that occur in the units. The MPB-epidemic mortality to the lodgepole pine forest type set the stage for the next age class of naturally regenerated lodgepole pine stands throughout the project area. This proposal changes the trajectory described in the alternative 1 only for the harvest activities on the proposed 3,573 acres, thereby removing what is now a vertical fuel structure that in time would fall over; the majority will fall over in the next 5 years (5-15 years after the trees were killed by MPB; Mitchell and Preisler 1998).

With this proposed treatment, the new stands would develop without the physical barriers created by falling, jack-strawed logs, allowing future management of these stands such as thinning to improve stand health and vigor. This proposed action on 16 percent of the total lodgepole pine acres within the project area increases the acres in the 0- to 5-inch d.b.h. class. The desired future stand condition created by clearcut harvest is an open to moderately dense stands averaging 80 square feet of basal area with a range of 60 to 100 square feet basal area, intermixed with Douglas-fir and aspen, with minor amounts of spruce, whitebark pine and subalpine fir. The harvested acres overtime (50 or more years) would create mid- to late- seral stands of larger diameter more quickly as compared to stands without harvest. The remaining 84 percent (all lodgepole pine acres not treated) of the lodgepole pine vegetation type would continue on the projected trajectory described in the no action alternative.

The direct effect is the clearcut harvest of all lodgepole pine greater than 5 inches in diameter; these units would be large open areas (average size: 95 acres) with live trees consisting of Douglas-fir, subalpine fir and spruce with occasional whitebark pine, aspen, and live lodgepole pine less than 5 inches diameter. Less than 5 percent live canopy coverage would be expected to remain in the units after salvage harvest.

The immediate increase in available light created through the salvage treatments would stimulate understory vegetation including growth of seedling and sapling Douglas-fir, lodgepole pine, and aspen. The solar heating at ground level would open the lodgepole pine serotinous cones. By salvaging lodgepole pine rather than allowing the dead trees to fall to the forest floor, there would be an increase in the density and growth rate of the new stand thereby shortening the timeframe of establishment and subsequent growth than if these stands were not salvaged (Romme et al. 1986). FACTS database queries show that all stands are expected to be fully stocked within five years after completion of harvest units; 93 percent of harvested stands on the HLCNF reach certification of being fully stocked with natural regeneration with the remainder being planted to reach full stocking. The minimum stocking level for certification of all regeneration harvest is 150 trees per acre.

Over the next 50 years, stand density would be managed (through precommercial thinning) to perpetuate a more open and relatively evenly spaced stand of lodgepole pine to improve individual tree growth and vigor; reduce crown fire potential; promote younger age class of wind-firm, bark beetle-resistant lodgepole pine; and increase the

quantity of longer-lived species such as Douglas-fir and aspen. The 50 year trend for the salvage harvest of dead and dying lodgepole pine would be open to moderately dense lodgepole pine with minor amounts of other tree species stands that are resilient to inherent disturbance regimes (insects and fire) as is described in the Desired Condition section of this analysis. FVS modeling (see project file for FVS outputs) shows that in 50 years there would be fast growing lodgepole at moderate densities. Shrubs and forbs would be common, but are low growing. Species composition in 50 years would be primarily lodgepole pine with some Douglas-fir, aspen, subalpine fir, whitebark pine, and Engelmann spruce.


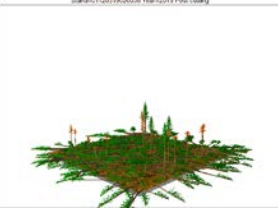
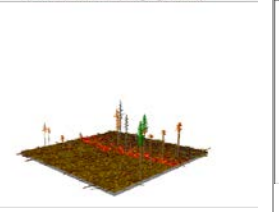

Year 2015	Year 2015 –Treatment in Unit 18		Year 2065
			
Unit 18 (stand 319-02-036) prior to treatment – existing condition with bug-killed fuel loading – most on the ground.	Clearcut harvest followed by broadcast burn within Unit 18.		Simulated stand conditions in 50 years depicts a two-aged stand vigorous lodgepole with mature scattered large trees.

Figure 38. FVS Modeled clearcut with leave tree in lodgepole pine vegetation type.

Most of the lodgepole pine type in the project area would be in a mid-seral-pole size class due to the current mountain pine beetle activity in the project area. FVS modeling has indicated that stands that are not managed would have smaller mean diameters in 50 years than stands that are managed.

Seed tree with leave trees

The proposed prescription for the 298 acres (all on FS lands) of seed tree with leave tree treatment is to remove the dead and dying lodgepole; the best, full-crowned green trees (principally Douglas-fir) would be retained at 10 to 20 trees per acre to provide a means to disperse seed. The MPB-epidemic mortality to the lodgepole pine forest type set the stage for the next age class of naturally regenerated lodgepole pine stands throughout the project area. The 298 acres of seed tree harvest would allow for a greater diversity of natural regeneration, and where needed or appropriate, planting of ponderosa pine or Douglas-fir may occur to ensure a diverse future stand.

Other than these stands being comprised of a more diverse mix of species other than lodgepole and that the proposed prescription would retain a more even distribution of seed trees, the resulting direct, indirect and future stand projections are similar to the clearcut harvest treatment described in the discussion above. The retention of seed trees at 10 to 20 per acre would result in large diameter (over 30 inches with Douglas-fir) trees scattered across the treated acres in 50 years. FVS modeling did not take place for these units as stand data was not available, but the FVS projections would have the appearance and future stand structure attributes between the figures displayed for clearcut and shelterwood.

Shaded fuel break

These units are comprised of a more diverse mix of species, including lodgepole pine and Douglas-fir. With the MPB beetle epidemic, these stands became a mix of dead and live trees. These units tend to be on ridges or similar topographic features, in that the design for the unit location is to create a fuel break to aid in controlling mixed severity prescribed fire treatments (see below discussion). The existing dead trees and the majority of the understory trees would be hand or mechanically cut to increase canopy spacing and to alter the fuel profile, creating a shaded fuel break of the live, larger trees available within the unit. Thin from below (i.e., “crown thinning”) in order to reduce density from an average of 100-140 to 50-80 basal area; the end result would be very similar to the improvement harvest treatment actions discussed above. Slash created would be handpiled and burned or jackpot burned where feasible to reduce surface fuel loadings. Shaded fuel breaks would vary in width depending on topography, aspect and slope, stand composition, and expected fire behavior adjacent to the fuel break.

These stands are comprised of a diverse mix of species with a high percentage of dead lodgepole but a similar high amount of Douglas-fir. Therefore, other than there would be no commercial removal of sawlog products within these acres, the proposed hand-treatment and understory/jackpot burn prescriptions would retain nearly the same post-treatment condition as the improvement harvest prescription described above. The resulting direct, indirect and future stand projections for this mixed forest type therefore are similar to the improvement harvest treatment described in the discussion above.

Mixed severity prescribed fire

The proposal is to use ignited fire to prescribed burn 1,714 acres (all on FS lands) on of mid-elevation mixed conifer stands with the lodgepole pine dominated patches the principle objective to burn.

Prescribed fire would use either both aerial ignition and hand-lighting. Some hand-falling of trees may occur to facilitate burning objectives. Burning would occur when weather and ground conditions are suitable to maintain air quality and burning can be controlled; this timing may be in spring or fall. Ignitions may occur over multiple years.

This larger scale “Landscape Ecosystem Burn” is a mosaic of prescribed fire types and intensities resulting in a strategic landscape mosaic of fire effects – about 40-60 percent of each unit would be burned. Mechanical rearrangement of fuels will be used in some areas to contain aerial ignition zones – which are principally dead lodgepole stands. Proposed treatments are not necessarily ‘natural’, though are designed to create more heterogeneous conditions that existed in the past; diverse forest vegetation structure provides the basis for maintaining forested ecological communities that are resilient.

Ignition patterns for the mixed severity prescribed fire units would be designed so that the concentrations would burn for areas up to 20 acres in size (which may include crown fire), but fire is not carried throughout the unit. A spring-time burn would allow much more control over the spread of fire over the ground vegetation. The fire effects from heat to conifers in a spring time burn would be greater, as conifers are more susceptible at that time due to their growing buds. Conifer buds harden in the fall, so trees would be

less susceptible with a fall burn, but fire spread over the ground vegetation would be more difficult to control.

Although whitebark pine as a vegetation type is a small percentage (about 4 percent) of the project area, and is not the objective of proposed treatments, there may be an effect to whitebark pine with the mixed severity burning. Whitebark pine has not been located in any of the proposed units. However, there may be scattered individual whitebark pine trees within treated areas with potential of effects to individual scattered trees. However, all of the acres proposed for this treatment type are below the elevation of the more common occurrence of whitebark pine in the project area. If whitebark is found, the mitigation measure of felling of conifers prior to burning activities would create a fuel space buffer near whitebark pine. Additionally, ignition patterns would avoid the use of fire directly in areas of units that have concentrations of whitebark pine. Conducting the prescribed burn during spring conditions controls fire spread. The potential effects to whitebark pine could be greater with fall burning, as fire spread with ground vegetation would be more difficult to control. With all acres proposed with this treatment, favorable conditions for new whitebark pine regeneration would result with proximity of mature cone-bearing whitebark pine trees, even with the elevation being lower than whitebark pine occurrence.

The direct effect of burning in these lodgepole dominated stands within mixed conifer forest would be the killing of overstory and understory conifers in a patch mosaic across the proposed unit. The fire would directly consume a portion of the existing vertical and horizontal fuel, some of which has been created by bark beetles working in the project area. The fire would also likely consume newly established lodgepole pine (post MPB-epidemic) creating less dense conifer stands in the future. Another direct effect would be a limited amount of burning in the grass, herb and shrub understory communities; the amount is limited due to the spring-time burning conditions. Fall burning would directly affect more understory vegetation communities, providing more opportunity to rejuvenate these ground-cover species.

The indirect effect of the mixed severity prescribed fire in mixed conifer stands would be a re-growth of senesced grass, herb and shrub understory communities and natural regeneration of lodgepole pine and some whitebark pine.

FVS modeling shows that in 50 years there would be fast growing lodgepole at moderate densities. Shrubs and forbs would be common, but are low growing. Species composition in 50 years would be primarily lodgepole pine with some Douglas-fir, aspen, subalpine fir, and Engelmann spruce.

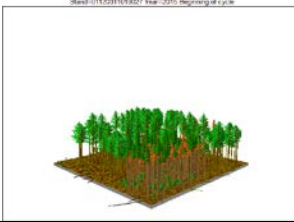
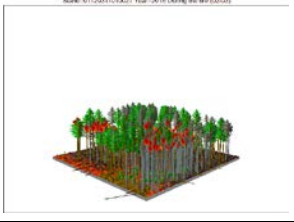
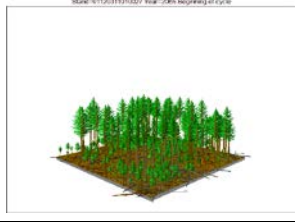
Year 2015	Year 2015 –Treatment in Unit 116c	Year 2065
		
Unit 116c (stand 311-01-027) prior to treatment – existing condition with bug-killed fuel loading.	Mixed severity burn within Unit 116c; simulation shows a mix of ground fire with some individual trees torching.	Simulated stand conditions in 50 years depicts a two-aged stand vigorous lodgepole with mature open-grown trees.

Figure 39. FVS modeled mixed severity prescribed fire in lodgepole pine vegetation type.

Private Land Buffers

The objective and prescription for this treatment is described in the Douglas-fir and ponderosa pine section above. In this forest type, the narrow objective would result in a similar effect to vegetation as is described in the clearcut harvest discussion above. These units are comprised mostly of lodgepole pine that is dead, with some Douglas-fir and other conifer species. However, the direct, indirect and projected development of the private land buffer treatments in the lodgepole pine vegetation type are the same as discussed in the clearcut harvest portion of this analysis.

Precommercial Thin

Precommercial thins (non-commercial) would be used to treat naturally regenerated and planted trees in previously harvested or natural disturbance lodgepole pine stands over 92 acres (all on FS lands). Other than this stands being dominated by lodgepole with a small amount of other conifer species, the proposed prescription and resulting direct, indirect and future stand projections are similar to the precommercial thin treatment described in the Douglas-fir and ponderosa pine vegetation discussion above.

Other Alternative 2 Direct/Indirect Effects

Snags

Alternative 2 proposes treatment on 38 percent of the project area; the remaining 62 percent of the area would have no existing snags removed under this project. Untreated areas are well-distributed and connected. The treatment types are assessed for general effects to snags as follows:

- Intermediate Harvest, Shaded Fuel Break and Private Land Buffers (5,989 acres proposed): A stand of live residual trees is retained which provides for future snag recruitment. Snag removal would occur; however in harvest units, all snags > 20" dbh would be retained along with additional smaller snags to average at least 2 snags per acre of the largest, most windfirm snags available (meeting Forest Plan standards). Snag recruitment would occur to a lesser amount and at a slower pace due to treatment design to increase tree vigor and resiliency thereby lower susceptibility to mortality.
- Regeneration Harvest (4,234 acres proposed; includes clearcut, seed tree and shelterwood): These treatments result in removal of most of the existing

overstory, including existing snags. All snags > 20" dbh would be retained along with additional smaller snags to average at least 2 snags per acre of the largest, most windfirm snags available (meeting Forest Plan standards). Scattered individual or patches of live tree reserves would be identified to provide seed, structure, snag recruitment, and species diversity. Future (next 50 years) snag recruitment would be limited to the mature reserve trees retained with the proposed action.

- Prescribed Fire: (13,614 acres proposed; includes low severity and mixed severity): Few snags would be felled in these areas, limited to those necessary for safety and fire containment purposes. Target overstory mortality in burning areas would vary depending on objectives, ranging from fuel reduction to site preparation for regeneration. In all cases, snag creation would occur. The loss of any snags would be replaced by creation of new snags with the proposed treatment. In the near future, some additional snags are expected to be created due to post-fire secondary effects. Long-term (50 years) snag recruitment would occur to a lesser amount and at a slower pace due to an increase tree vigor and resiliency thereby lower susceptibility to mortality.
- Pre-commercial thinning (471 acres proposed): These areas were previously harvested and generally contain few to no snags. The treatment is focused on thinning young trees. There would be little to no impact on snags; if they occur, they would be retained.

The indicator for effects to snags correlates to the Forest Plan standard of providing for a minimum of 2 snags per acre at the third order drainage scale. The measure is an estimate of snags per acre for each third order drainage using ADS data (see Existing Condition analysis). While snag retention and creation would occur as described in the Design Criteria, to make a simplified and conservative estimate it was assumed that no snags would be retained in harvest, shaded fuel break and private land buffer treatment units (a total of 9,578 acres). The number of beetle-killed snags that could be lost was calculated by taking the total trees per acre killed in the watershed and subtracting the quantity of snags in the 9,878 acres of treatment units. Some treatment units are not in a third order drainage, so the acreage does not match total treatment acres. Due to the extensive number of snags, and relatively small area proposed for treatment, the snags remaining after treatment are still in excess of the Forest Plan minimum standard of 2 per acre. Additional snags from older mortality not recorded by ADS may also be present, and more would be created by prescribed burning. Diameter distribution is not available in ADS, but in general snags would be the largest diameter available due to MPB feeding preferences. Snags >20" dbh would be rare because trees in that size class are rare; however mitigation measures require all snags >20" dbh to be retained. Adequate snags and linkages would be provided. This assessment of bark beetle snags provides a minimum estimate that assures that Forest Plan standards are met.

Table 40. Beetle-killed snags per acre in third order drainages post-treatment, alternative 2

3 rd Order Drainag e	ADS # trees killed by bark beetles 2006-2012	Average Snags/acre	# Snags in Treatment Units, Potential to be Cut	Number of Beetle- created Snags Remaining Post-Treatment	Post- Treatment Alt 2 Average Snags/acre 3 rd Order Drainage-wide
1001-1	1,610,597	100	348,300	1,262,297	78
1001-2	655,976	195	348,670	307,306	91
1001A	827,243	206	47,380	779,863	194
0814	697,228	71	125,528	571,700	58
0809C	66,865	35	1,470	65,395	34

Forest Carbon Cycling and Storage

The treatments in the alternative 2 would reduce on-site carbon sources by removing the dead and dying lodgepole component that would release stored carbon during decomposition. Forested environments over time are renewable carbon sinks. With the removal of the dead trees, overall carbon sequestration would begin to increase more rapidly in the treated stands when compared to the no action alternative by increasing the health and vigor of the remaining trees and understory vegetation, and by promoting regeneration of seedlings for the next stand. In general, such management actions as those proposed in the project could improve the resilience of forests to climate-induced increases in frequency and intensity of disturbances such as fire and insect and disease epidemics. Utilizing harvested trees for long-lasting forest products and renewable energy sources may help sustain the current strength of the carbon sink in U.S. forests (Birdsey et al. 2006 and 2007).

In the short term, the actions proposed by this alternative would release some carbon currently stored through harvest of live and dead trees (US EPA 2010; Depro et al 2008). Motorized equipment used during any of the proposed activities would emit greenhouse gasses. For at least the short term, on-site carbon stocks would be lower under the Action Alternatives than under No Action. Actions such as the proposed intermediate harvests may, in some cases, increase long-term carbon storage (Finkral and Evans 2008; North et al. 2009; Mitchell et al. 2009) but current research in this field shows highly variable and situational results (Mitchell et al. 2009; Reinhardt and Holsinger 2010; Ryan et al. 2010; McKinley et al. 2011). See also the discussion of forest carbon cycling and storage under the Affected Environment – Existing Conditions section.

The lodgepole pine stands recently killed by MPB are estimated to be functioning as a net carbon source to the atmosphere. Removal of dead wood would reduce on-site carbon stores; with conversion of the dead wood into wood products this would shift these carbon stores to where the wood products are utilized. The portion removed as wood products may partially delay carbon release relative to on-site decay rates. These stands would continue to emit more carbon than they absorb and would remain net carbon sources until trees that sequester additional carbon are well established. Monitored regeneration would help ensure these forest stands return to a carbon sink function as quickly as possible. As the stands continue to develop, the strength of the carbon sink would increase until peaking at an intermediate age and then gradually decline but remain

positive (Pregitzer and Euskirchen 2004). Carbon stocks would continue to accumulate as the stands mature, although at a declining rate, until impacted by future disturbances.

To the extent proposed actions reduce the risk or delay the event of future stand-replacing disturbance events, potential emissions from those events are equally reduced or forestalled. The vegetation treatments are designed to enhance forest resiliency to disturbances such as wildfire and insect outbreaks.

Sustaining forest productivity and other multiple-use goods and services requires that land managers balance multiple objectives. The long-term ability of forests to sequester carbon depends in part on their resilience to multiple stresses, including increasing probability of drought stress, high severity fires, and large scale insect outbreaks associated with projected potential climate change. Management actions (such as those proposed with this project) that maintain the vigor and long-term productivity of forests and reduce the likelihood of high severity fires and insect outbreaks can maintain the capacity of the forest to sequester carbon in the long-term. Thus, even though some management actions may in the near-term reduce total carbon stored below current levels, in the long-term they maintain the overall capacity of these stands to sequester carbon while also contributing other multiple-use goods and services (Reinhardt and Holsinger 2010).

Table 41. Alternative 2 response to resource indicators.

Resource Indicator(s)	Response
MPB-impacted forest regenerated	The most acres (4,001) of MPB-impacted forests are regenerated with this action alternative. With this proposed treatment, the new stands would develop without the physical barriers created by falling, jack-strawed logs, allowing future management of these stands such as thinning to improve stand health and vigor. These managed forests would increase in density and growth shortening the timeframe of establishment then the MPB-killed unmanaged forests (Romme et al. 1986). Over the next 50 years, stand density would be managed to perpetuate a more open and relatively evenly spaced stand of lodgepole pine, ponderosa pine and Douglas-fir to improve individual tree growth and vigor and to reduce crown fire potential. Within the estimated 23,541 acres of pine dominated forests killed by MPB, 17 percent of these forests would be assured of regeneration within a 5 year period and managed in the future as large diameter forests.
Resilience within forested stands	Alternative 2 creates the most acres resilient to future disturbances; the combined 17,575 acres of treatments with Improvement Harvest, Shaded Fuel Break, Low Severity Prescribed Fire, Precommercial Thin and Private Land Buffers would see an increase in resiliency. These treatments convert dense (high basal area) and multi-storied stands (with layering of different aged trees) into open-grown, variably spaced trees. The resultant post-treatment stand structure would be similar to what would have been created with a frequent-fire-interval disturbance regime; these treatments approximate desired conditions by creating relatively open, large-tree dominated structures primarily composed of seral species (Feidler et al 2010). Thinning from below and retaining the largest trees with subsequent surface fuel reduction by fire is the most effective treatment when the goal is to reduce potential fire behavior and severity and increase forest resiliency (Stephens et al 2009). Within the project area, resilience within forested stands is improved on 28 percent of the land area.
Landscape heterogeneity	Disturbances both respond to and create landscape heterogeneity (Turner 2010); Alternative 2 generates the most variability in forested structure with about 5,715 acres of early seral conditions created by the Regeneration Harvest and Mixed Severity Prescribed Fire treatments. Emulating natural disturbances in forest land management practices is seen as an effective strategy to create heterogeneity (Turner 2010). Large disturbances create significant spatial heterogeneity (Turner 2010); Alternative 2's average early seral unit size is 102 acres and varies from 10 acres to 523 acres (median size is 71 acres). The 56 total early seral units across the project area improving heterogeneity. Although the treated acreage is high, only 24 percent of the estimated 23,541 acres of pine dominated forests killed by MBP are treated. Within the project area, heterogeneity is improved on 9 percent of the land area.

Irreversible/Irretrievable Commitments

Harvested trees would be removed from the project area. Prescribed fire would kill some live trees. Existing fuel loads would be reduced and the fuel profile altered in all units.

Alternative 3

Alternative 3 is designed in response to issues presented in both internal and external scoping comments about potential treatment effects on Inventoried Roadless Areas, wildlife, and recreationist values associated with the numerous trail systems in the project area. Alternative 3 has the following design elements that differentiate the actions proposed from alternative 2:

- No mechanized treatment or commercial harvest within IRAs; the exception to this is mechanized treatments would be allowed within private buffer units.
- Minimize treatments within existing elk security areas.

- Limit mechanical equipment on existing non-motorized trails.
- Retain the existing green islands of trees to the extent possible, especially near elk security areas.
- Reduce overall treatments within IRAs.
- Reduce and/or minimize new road construction.

As a result of removing mechanized treatment and commercial harvest within IRAs, minimizing treatments in elk security areas and minimizing new road construction Alternative 3 treats fewer acres than alternative 2. In consideration of the design elements described above, a hard look at unit location in terms of the design elements while meeting the purpose and need was done by the interdisciplinary team. The outcome was that new units established in strategic areas to meet the purpose and need were developed that are expected to result in differences in meeting the objectives of this project. However, the treatment prescriptions did not change; therefore the analyses by the three forest vegetation types (Douglas-fir and ponderosa pine, lodgepole pine and mixed conifer) for alternative 2 are the same for alternative 3.

Table 42. Differences in acres treated between alternative 2 and alternative 3

Vegetation Treatment	Alternative 2 (Acres)	Alternative 3 (Acres)	Total Difference (Acres)
Improvement Harvest	2,483	1,382	1,101
Clearcut with Leave Trees	3,573	2,348	1,225
Seed Tree with Leave Trees	298	0	298
Shelterwood with Leave Trees	363	102	261
Shaded Fuel Break	1,415	1,282	133
Low Severity Grassland Prescribed Fire	0	1,662	-1,662
Low Severity Prescribed Fire	11,900	7,952	3,948
Mixed Severity Prescribed Fire	1,714	656	1,058
Private Land Buffers	2,091	2,283	-192
Precommercial Thin	471	445	26
Total	24,308 acres	18,112 acres	6,196 acres

Direct/Indirect Effects

The direct and indirect effects are the same for Alternative 3 as described for in the Alternative 2 discussion. The fewer treated acres of harvest (2,240 less acres) and prescribed fire (3,930 less acres) with Alternative 3 as compared to alternative 2 results in those un-treated acres being less resilient, heterogeneous, and reduces assurances of regeneration and future management options. Those untreated acres would develop on the projected trajectory described in the no action alternative.

Alternative 3 has 15 units that exceed 40 acres in size all of which are on FS lands (see below); this is 17 fewer units than alternative 2. The regeneration harvest proposed to exceed 40 acres in size include: clearcut with reserve trees (13 units for a total of 2,150 acres); and shelterwood with reserve trees (two units totaling 101 acres).

Table 43 below); this is 17 fewer units than alternative 2. The regeneration harvest proposed to exceed 40 acres in size include: clearcut with reserve trees (13 units for a total of 2,150 acres); and shelterwood with reserve trees (two units totaling 101 acres).

Table 43. Regeneration harvest units that exceed 40 acres in size.

Unit	Acres	Unit	Acres	Unit	Acres
5	53	19	169	29a	45
11	523	20	85	35	42
15	70	22	130	39c	43
17	72	23	90	110b	58
18	395	24	77	180	397
Average (small, large): 150 (42, 523)					

The units that exceed 40 acres were designed to encompass past fire and insect disturbance patterns that created a patch mosaic of stands. The large units proposed for treatment are an indication of the variability in size and shape of these past disturbances. Large patch sizes that comprise the units that exceed 40 acres provide the structure and arrangement of conifer forests that naturally occur within landscape that is the Tenmile – South Helena project area.

Acres treated in the three forest vegetation types (Douglas-fir and ponderosa pine, lodgepole pine and mixed conifer) for alternative 3 are less than for alternative 2. The below table displays the amount by treatment type in dry-warm forests (Douglas-fir and ponderosa pine) and in cool-moist forests (lodgepole and mixed conifer combined).

Table 44. Acres treated by forest vegetation type with alternative 3

Vegetation Treatment	Douglas-fir & ponderosa pine type (Acres)	Lodgepole & mixed conifer type (Acres)
Improvement Harvest	1,382	-
Clearcut with Leave Trees	-	2,348
Seed Tree with Leave Trees	-	-
Shelterwood with Leave Trees	102	-
Shaded Fuel Break		1,282
Low Severity Grassland Prescribed Fire	1,662	-
Low Severity Prescribed Fire	7,952	-
Mixed Severity Prescribed Fire	656	-
Private Land Buffers	847	1,436
Precommercial Thin	353	92
Total	11,470	5,158

The one additional treatment type not in alternative 2 is described below.

Douglas-fir and ponderosa pine vegetation type

Low Severity Grassland Prescribed Fire

The proposal is to use hand treatments and ignited fire over 1,662 acres of open grassland with few scattered trees and small inclusions of dry mixed conifer forests (comprised principally of Douglas-fir and ponderosa pine). Low severity grassland prescribed burning would be used to improve grassland and grass-shrub areas to reduce encroaching conifers. Mechanical and hand rearrangement of fuels would occur, with smaller diameter (less than 12 inch) trees strategically slashed or thinned, slash created from these treatments would be hand-piled and burned or jackpot burned.

Treatments in low elevation, dry forests-grasslands that approximate desired conditions (as described in the Desired Condition section) create relatively open grasslands with few conifers. Prescribed burning in low severity units with this proposal would return the fire as a disturbance process to the Tenmile – South Helena project area. However, with these treatments fire would only be used in areas where conifers occur to reduce conifer encroachment in dry grasslands. Burning would occur when weather and ground conditions are suitable to maintain air quality and burning can be controlled; this timing may be in spring or fall. Ignitions may occur over multiple years. Long-term resilience would be improved with these disturbances; without additional future disturbances that are similar to the natural fire intervals of the past, these forest types would revert back to the conditions described in the no action alternative.

The direct result from the low severity grassland prescribed fires would be the cutting of encroaching conifers and the burning of grass, herb and shrub understory communities, along with the killing of seedling and sapling sized conifers that have encroached into the grassland. A few overstory trees (less than 5 percent) may also be killed from the burning. Spring burning would be more of an impact to the overstory trees, as the tree buds would be more susceptible to heat. Fall burning would be less of an impact as the tree buds would be hardened, and more able to withstand heat generated from burning. The indirect effect of the low severity prescribed fire would be a re-growth of senesced grass, herb and shrub understory communities, and an additional less than 10 percent of overstory tree mortality due to secondary effects of the prescribed fire. In 10 to 20 years this treatment would result in fewer conifers encroaching in the grassland where it is present than compared to stands that had no burning (see no action alternative discussion); without a similar treatment in the future, in 20 to 50 years the succession of conifers would create conditions similar as today.



Proposed Action	Example of existing stand conditions	General changes in forest vegetation conditions with prescribed treatment	Example of post-treatment conditions
Low Severity Grassland Prescribed Fire		Grassland areas would have conifers encroaching removed by mechanical and hand rearrangement of fuels, with smaller diameter (less than 12 inch) trees strategically slashed or thinned. Slash created from these treatments would be handpiled and burned or jackpot burned. No active ignition will occur in the open grasslands or adjacent timber stands, fire may spread into these areas exhibiting low intensity burn characteristics. Succession would be set back to retain grassland, and alter fire intensity.	

Figure 40. Grassland treatment in Douglas-fir and ponderosa pine vegetation type.

Other Alternative 3 Direct/Indirect Effects

Snags

Alternative 3 proposes treatment on 28 percent of the project area; the remaining 72 percent of the area would have no existing snags removed under this project. Untreated areas are well-distributed and connected. The treatment types are assessed for general effects to snags as follows:

- Intermediate Harvest, Shaded Fuel Break and Private Land Buffers (4,947 acres proposed): A stand of live residual trees is retained which provides for future snag recruitment. Snag removal would occur; however in harvest units, all snags > 20" dbh would be retained along with additional smaller snags to average at least 2 snags per acre of the largest, most windfirm snags available (meeting Forest Plan standards). Snag recruitment would occur to a lesser amount and at a slower pace due to treatment design to increase tree vigor and resiliency thereby lower susceptibility to mortality.
- Regeneration Harvest (2,450 acres proposed; includes clearcut and shelterwood): These treatments result in removal of most of the existing overstory, including existing snags. All snags > 20" dbh would be retained along with additional smaller snags to average at least 2 snags per acre of the largest, most windfirm snags available (meeting Forest Plan standards). Scattered individual or patches of live tree reserves would be identified to provide seed, structure, snag recruitment, and species diversity. Future (next 50 years) snag recruitment would be limited to the mature reserve trees retained with the proposed action.
- Prescribed Fire: (8,608 acres proposed; includes low severity and mixed severity; grassland is excluded as few large conifers would be impacted): Few snags would be felled in these areas, limited to those necessary for safety and fire containment purposes. Target overstory mortality in burning areas would vary depending on objectives, ranging from fuel reduction to site preparation for regeneration. In all cases, snag creation would occur. The loss of any snags would be replaced by creation of new snags with the proposed treatment. In the near future, some additional snags are expected to be created due to post-fire secondary effects. Long-term (50 years) snag recruitment would occur to a lesser

amount and at a slower pace due to an increase tree vigor and resiliency thereby lower susceptibility to mortality.

- Pre-commercial thinning (445 acres proposed): These areas were previously harvested and generally contain few to no snags. The treatment is focused on thinning young trees. There would be little to no impact on snags; if they occur, they would be retained.

The indicator for effects to snags correlates to the Forest Plan standard of providing for a minimum of two snags per acre at the third order drainage scale. The measure is an estimate of snags per acre for each third order drainage using ADS data (see Existing Condition analysis). While snag retention and creation would occur as described in the Design Criteria, to make a simplified and conservative estimate it was assumed that no snags would be retained in harvest, shaded fuel break and private land buffer treatment units (a total of 7,379 acres). The number of beetle-killed snags that could be lost was calculated by taking the total trees per acre killed in the watershed and subtracting the quantity of snags in the 7,379 acres of treatment units. Some treatment units are not in a third order drainage, so the acreage does not match total treatment acres. Due to the extensive number of snags, and relatively small area proposed for treatment, the snags remaining after treatment are still in excess of the Forest Plan minimum standard of 2 per acre. Additional snags from older mortality not recorded by ADS may also be present, and more would be created by prescribed burning. Diameter distribution is not available in ADS, but in general snags would be the largest diameter available due to MPB feeding preferences. Snags greater than 20 inch dbh would be rare because trees in that size class are rare; however mitigation measures require all snags greater than 20 inch dbh to be retained. Adequate snags and linkages would be provided. This assessment of bark beetle snags provides a minimum estimate that assures that Forest Plan standards are met.

Table 45. Beetle-killed snags per acre in third order drainages post-treatment, alternative 3

3rd Order Drainage	ADS # trees killed by bark beetles 2006- 2012	Average Snags/acre	# Snags in Treatment Units, Potential to be Cut	Number of Beetle- created Snags Remaining Post-Treatment	Post-Treatment Alt 3 Average Snags/acre 3rd Order Drainage- wide
1001-1	1,610,597	100	352,000	1,258,597	78
1001-2	655,976	195	77,415	578,561	172
1001A	827,243	206	39,140	788,103	196
0814	697,228	71	79,946	617,282	63
0809C	66,865	35	140	66,725	35

Response to Resource Indicators

Table 46. Alternative 3 response to resource indicators.

Resource Indicator(s)	Response
MPB-impacted forest regenerated	Fewer acres (2,450) of MPB-impacted forests are regenerated with Alternative 3 as compared to Alternative 2. The treated stands would develop without the physical barriers created by falling, jack-strawed logs, allowing future management of these stands such as thinning to improve stand health and vigor. These managed forests would increase in density and growth shortening the timeframe of establishment then the MPB-killed unmanaged forests (Romme et al. 1986). Over the next 50 years, stand density would be managed to perpetuate a more open and relatively evenly spaced stand of lodgepole pine, ponderosa pine and Douglas-fir to improve individual tree growth and vigor and to reduce crown fire potential. Within the estimated 23,541 acres of pine dominated forests killed by MPB, 10 percent of these forests would be assured of regeneration within a 5 year period and managed in the future as large diameter forests.
Resilience within forested stands	Alternative 3 creates fewer acres resilient to future disturbances than with Alternative 2. A total of 13,988 acres of treatments with Improvement Harvest, Shaded Fuel Break, Low Severity Prescribed Fire, Low Severity Grassland Prescribed Fire, Precommercial Thin and Private Land Buffers would see an increase in resiliency. These treatments convert dense (high basal area) and multi-storied stands (with layering of different aged trees) into open-grown, variably spaced trees. The resultant post-treatment stand structure would be similar to what would have been created with a frequent-fire-interval disturbance regime; these treatments approximate desired conditions by creating relatively open, large-tree dominated structures primarily composed of seral species (Feidler et al 2010). Thinning from below and retaining the largest trees with subsequent surface fuel reduction by fire is the most effective treatment when the goal is to reduce potential fire behavior and severity and increase forest resiliency (Stephens et al 2009). Within the project area, resilience within forested and grassland stands is improved on 23 percent of the land area.
Landscape heterogeneity	Disturbances both respond to and create landscape heterogeneity (Turner 2010); Alternative 3 generates variability in forested structure with about 3,106 acres of early seral conditions created by the Regeneration Harvest and Mixed Severity Prescribed Fire treatments. Emulating natural disturbances in forest land management practices is seen as an effective strategy to create heterogeneity (Turner 2010). Large disturbances create significant spatial heterogeneity (Turner 2010); Alternative 3's average early seral unit size is 124 acres and varies from 18 acres to 523 acres (median size is 72 acres). The 25 total early seral units across the project area improving heterogeneity. Alternative 3 treats 11 percent fewer acres of MPB killed forests as compared to Alternative 2; Alternative 3 treats a total of 13 percent of the estimated 23,541 acres of pine dominated forests killed by MBP are treated. Within the project area, heterogeneity is improved on 5 percent of the land area with Alternative 3.

Irreversible/Irretrievable Commitments

Harvested trees would be removed from the project area. Prescribed fire would kill some live trees. Existing fuel loads would be reduced and the fuel profile altered in all units.

Cumulative Effects Analysis for Alternative 2 and Alternative 3

The forest vegetation spatial cumulative effects analysis area is the project area, and encompasses 61,395 acres (Forest Service ownership, 49,546 acres; BLM ownership, 1,043; private ownership, 7,512 acres; other ownership, 799 acres – includes 138 acres of City of Helena ownership). The temporal timeframe covers the span of time in known

past activities that have affected the existing condition of the forested vegetation community, and with which the effects of the proposed actions were analyzed. This period takes into account the cumulative effects of all actions up to the present, considers the effects of the proposed actions, and extends into the future by considering reasonably foreseeable actions that are on-going or scheduled to occur within the next five years. These on-going and future activities may occur regardless of which alternative is chosen.

The spatial and temporal bounds define the extent of the forest vegetation community within the project area that is reflective of the disturbance regimes that express landscape level processes. Although influences outside of the project area, such as large scale fires burning into the analysis area or wider-spread effects of climate change do shape the forest vegetation, it is the forest vegetation within the defined spatial and temporal bounds that reflects those changes.

Past Actions

The environmental analysis required under National Environmental Policy Act is forward-looking in that it focuses on the potential impacts of the proposed action that an agency is considering. Specific past actions considered in the affected environment and cumulative effects analysis are summarized below. The past actions summary is not necessarily exhaustive, as records may not exist for all past activities by project. This is particularly true for those actions that predate the passage of the National Environmental Policy Act in 1970. Nonetheless, the effects of such past actions are accounted for in the assessment of the existing condition, as the current condition of the forest vegetation community necessarily reflects any relevant impacts of such actions.

Land Management Practices

Timber was harvested in the Tenmile – South Helena project area to support mining, homesteading and settlement out in the valley. Timber harvest increased from the 1970s until now. Timber harvest activities included clearcut, seed tree, shelterwood, selection cut, and intermediate harvest (commercial thinning). Commercial timber harvest has occurred on about 5 percent of the project area. This includes harvest on other ownership lands (non- National Forest System lands).

The majority of Forest Service prescribed fire use has been disposal of logging slash or rearrangement of fuels. Some prescribed fire use has been for improving stand conditions for certain vegetation species (e.g. removing conifer succession in grassland-shrubland areas). Prescribed fire has occurred on about 9 percent of the project area over the past 70 years.

Table 47. Past timber harvest and fuels activities within the project area.

Decade of Activity	Activity	Activity Acres	Total Acres
1960-69	Timber Harvest	Regen Harvest: 45 acres Intermediate Harvest: 3 acres	48
	Fuels Activities	Fuels acres: 32 acres	32
1970-79	Timber Harvest	Regen Harvest: 444 acres Intermediate Harvest: 0 acres	444
	Fuels Activities	Fuels acres: 428 acres	428
1980-89	Timber Harvest	Regen Harvest: 299 acres Intermediate Harvest: 0 acres	299
	Fuels Activities	Fuels acres: 85 acres	85
1990-99	Timber Harvest	Regen Harvest: 36 acres Intermediate Harvest: 104 acres	168
	Fuels Activities	Fuels acres: 238 acres	238
2000-09	Timber Harvest	Regen Harvest: 8 acres Intermediate Harvest: 18 acres	26
	Fuels Activities	Fuels acres: 1,878 acres	1,878
2010-2015	Timber Harvest	Regen Harvest: 629 acres Intermediate Harvest: 513 acres	1,142
	Fuels Activities	Fuels acres: 2,247 acres	2,247
	Other ¹¹ Harvest (2005-2015)	Timber Harvest: 74 acres	74

Non-commercial tree thinning (also called pre-commercial thinning) has principally occurred in old regeneration harvest areas, including past clearcut, seed tree and shelterwood units. Non-commercial thinning has occurred on less than 1 percent of the project area.

Cattle grazing in the past have been of variable intensity. The effects of grazing may have contributed to the spread of invasive plants, such as knapweed, although the majority of invasive plant introduction is from motorized routes (roads and trails). Invasive weeds have been treated and are continuing to be treated with herbicides; dry grassland parks are susceptible to the threat of invasive weeds. (Refer to the Noxious Weeds and Livestock Grazing analysis.)

Refer to the Project File for the complete cumulative effects list of past activities. The complete list was reviewed and is part of this analysis.

¹¹ Timber harvest on Other than National Forest System lands, which include private, BLM and City of Helena. Acreage estimated from latest imagery.

Present and Reasonably Foreseeable Actions

Reasonably foreseeable actions include those management activities that are on-going or scheduled to occur within the next five years. These activities may occur regardless of which alternative is selected for implementation.

The table below displays the ongoing and reasonable foreseeable actions within the project area that are germane to this vegetation analysis; the list was compiled by HLCNF employees off of known and planned activities. Refer to the Project File for the complete cumulative effects list of ongoing and reasonably foreseeable future activities. The complete list was reviewed and is part of this analysis.

Table 48. Ongoing and foreseeable activities relevant to forest vegetation analysis.

Project/Activity Name	Decision Date and/or Status	Brief Description
Red Mountain Flume/Chessman Reservoir Project	Ongoing	Currently implementing fuel reduction project around Chessman Reservoir and the associated water flume infrastructure. Treatments are designed to reduce hazardous fuels around existing infrastructure. Approximately 500 total acres of fuels treatments and harvest are expected.
Timber Harvest Other non FS lands	Ongoing	Timber harvest may occur on private lands on unspecified acres, primarily tractor logging within the planning area
Weed Treatment on FS Lands	Ongoing	Herbicide treatment is primarily along roads and in patches that are accessible to mechanized equipment (spraying with ATVs) and/or by hand, biological (insects), goats/sheep, and aerial spraying. Treatment areas are identified in the EIS/ROD, continually updated, treated as new infestations are located.
Clancy Unionville Vegetation and Travel Management Project	Ongoing	Travel management, Forest vegetation improvements, Fuel treatments (non-activity fuels), Watershed improvements, Road improvements/construction, Road maintenance, Road decommissioning. Harvest activities have been completed, fuels treatments are ongoing.
Firewood Gathering	Ongoing	Personal firewood permits are issued for NFS lands. Dead trees may be cut which occurs mainly adjacent to roadways.
Tenmile Road Improvement (County Rd 695 - Rimini Road)	Foreseeable	Improve road way from the junction with Hwy 12 to the junction with the Chessman Reservoir intersection, just over 6 miles in length. Improvements would include replacement of three bridges and associated railings, bridge drainage improvements, upgrading road signs, re-alignment of road segments, and paving. Includes some tree removal.

The two vegetation projects, Red Mountain Flume and Clancy Unionville, are most relevant to this analysis, in that there are treatments similar in design and implementation as to the proposed activities with the Tenmile – South Helena project. The timber harvest on non- Forest System Lands also contribute positively to the three measurement indicators. The two HLCNF projects have been used as examples of what the proposed project would look like once completed. The acreage treated has been considered and contribute positively to the measurement indicators for this analysis. With the two projects, there are: 433 acres of MPB-impacted forests that are regenerated; 1,537 acres

of density reduction and resiliency improved; and the end-result of the two projects are a direct reduction in homogeneity and increase in heterogeneity for the acres treated within the project area. These types of projects have longer term benefits lasting in time over decades (see FVS modelling and associated discussion in the Effects Analysis for the action alternatives).

Firewood gather is a moderately small impact across the project area; variably variable in quantity and location. Relatively speaking, this activity does not contribute to the measurement indicators. There is a change in fuel profile, as the larger fuel (tree bole) are removed; however, the smaller fuels (branches and top) typically are left and become a more immediate fuel hazard. Without the firewood gathering, the dead tree would eventually fall, with the entirety of the fuel staying on site.

Weed treatments have virtually no impact to forest vegetation across the project area. There may be some minor impact to individual seedlings and their ability to become established from a change in vegetation competition with weed control. However, this activity does not contribute to the measurement indicators.

A small amount of tree removal is possible with the Tenmile Road Improvement project to facilitate upgrades to the road system. However, the scale of the impact is negligible to the forest vegetation resource and does not contribute to the measurement indicators.

Conclusions

The purposes of the project are to improve conditions for public and firefighter safety across the landscape in the event of a wildfire and to maintain consistent quantity and quality of water within the municipal watershed. In order to achieve these purposes, there is a need to create a mosaic of vegetation and fuel structure more resilient to disturbance which would provide for safer, more effective fire suppression actions.

Alternative 1 provides a basis for this analysis by examining no action in the project area, and clearly does not meet the purpose and need. In a post-beetle epidemic forested landscape, over 23,000 acres of pine-dominated mature stands of trees were killed, representing close to 40 percent of the Tenmile – South Helena project area. Most mature pine trees (lodgepole, ponderosa and whitebark) were killed in the epidemic, and the widespread presence of these now dead pine species in 52,000 acres of forested stands in the project area represents an increase in fuel loading that can feed future fire events, reduce within-stand resiliency, slow growth of future trees, and provide widespread continued landscape homogeneity if left un-treated. Analyzed over the long term, the MPB-changed forest has an increase of within stand heterogeneity, but represents a new paradigm of homogeneous forests compared to pre-MPB conditions. Alternative 1 does not provide resilient forests in the near or long term.

Both alternative 2 and alternative 3 address well the resource indicators. The variety of treatment intensities across most elevations in the project area decrease the existing homogeneous forest conditions; there is increasing evidence that spatial heterogeneity at multiple scales, in addition to forest structure and composition, is a critical component of ecosystem resilience (Churchill et al 2013).

There are differing degrees with which each action alternative address regenerating MPB-impacted forests, create resilience within forested stands, and create landscape heterogeneity (see response to resource indicators for each of the action alternatives). Both action alternatives vary patterns and structure types between stands, thereby varying risk levels and functional tradeoffs among different organisms and processes as well as economic and social factors (Churchill et al 2013). Both action alternatives were designed recognizing that trends in western Montana show a rise in extremes and seasonal temperature averages that has been two to three times greater than the global average (Pederson et al 2009); and that reducing forest density increases drought resistance of large trees, which will become increasingly important given the increasing frequency of dry years projected in the future (Kerhoulas et al 2013). Designing more fire resistant stands and landscapes (increasing landscape heterogeneity and resilience) will likely create forests more resistant to changes imposed on them by changing climates (Stephens et al 2009).

Moving beyond stand level treatments to landscape-level strategies should improve overall fuels management effectiveness (Stephens et al 2009; Finney 2005). Alternative 2 treats 38 percent of the Tennile – South Helena project area. Alternative 3 treats 28 percent of the Tennile – South Helena project area. All treatments reduce crown density and surface fuels. Treatments that include surface fuel reduction, particularly prescribed burning, are well supported for moderating potential wildfire potential (Martinson and Omi 2013; Prichard and Kennedy 2012; Graham et al 1999). Reducing crown density (thinning) followed by prescribed burning is also effective in reducing post-wildfire tree mortality (Prichard and Kennedy 2012). Both action alternatives are within the desired range of 20 to 40 percent landscape level treatments to effect fire behavior (Finney 2001; Finney et al 2006).

These treatments would appear to remain effective for up to 10 years, though longevity should be expected to vary by ecosystem productivity (Martinson and Omi 2013). The lower productive lands within the project area are expected to result in a longer period of treatment effectiveness.

Helena National Forest Plan Consistency

The results of the actions associated with alternative 1 (no action) clearly do not follow Forest Plan management area direction or objectives (see Table 49 below). Alternative 1 is within Forest Plan standards. There is an excessively high risk to the quality of water within the municipal watershed for the City of Helena from potential fires given not only the landscape-wide heavy fuel loading, but the trajectory of drier and hotter climate conditions conducive for larger fire events. The lack of action to improve heterogeneity and resiliency to forest vegetation community – provide for healthy timber stands and improve vegetative conditions – is unwarranted given the current forest conditions within the project area.

Alternative 2 best meets the timber and vegetation direction and objectives within the Forest Plan, and is within Forest Plan standards. However the location of some treatment units may not best meet other Forest Plan identified resource considerations (see other resource analysis sections). The results of actions proposed by alternative 2 would

remain within Forest Plan vegetation standards and objectives (see Table 49 below) and best meets the resource indicators for this analysis, compared to the other alternatives.

The result of the actions associated with alternative 3 clearly meets Forest Plan management area direction and objectives (see below table), and is within Forest Plan standards. Alternative 3 improves heterogeneity and resiliency to the forest vegetation community – provides for healthy timber stands and improves vegetation conditions – and is a contrast to alternative 1.

Table 49. Consistency check with the Helena Forest Plan

MAAs	Brief Management Area description	Alternative 1	Alternative 2	Alternative 3
H1	Provide healthy timber stands and optimize timber growing potential over planning horizon. Lands suitable for timber production. Even-aged stands will be scheduled for final regeneration harvest when they have reached the culmination of mean annual increment (CMAI).	Provides 0 acres of future healthy stands.	Provides 6,543 acres of healthy timber stands. Regen units have reached CMAI.	Provides 4,277 acres of healthy timber stands. Regen units have reached CMAI.
H2	Provide a quantity and quality of water which will...result in...a safe domestic water supply for the City of Helena. Provide healthy timber stands and optimize growing potential... Timber harvest practices include clearcutting, group selection, and shelterwood harvest, depending on...silvicultural objectives. Prescribed fire may be used as a tool to reduce natural fuels and improve quantity and quality of wildlife forage.	No change in quantity and quality of water; elevated risk to quality degradation ; excessively high fire risk from landscape-wide heavy fuel loads.	Creates resilient and heterogeneous landscape to increase success of fire suppression, providing a measure of protection to the watershed.	Creates resilient and heterogeneous landscape to increase success of fire suppression, providing a measure of protection to the watershed.
L1	Maintain or improve vegetative conditions and livestock forage production. Timber harvest may be used as a tool to improve forage production. Lands are classified as unsuitable for long-term sustained timber production.	Maintains but does not improve conditions.	Improves 23,290 acres of vegetative conditions and livestock forage.	Improves 17,094 acres of vegetative conditions and livestock forage.
L2	Maintain or improve range vegetative conditions and forage production for livestock and elk. Timber harvest may be used as a tool to improve forage production. However, forested lands are...unsuitable. Use prescribed fire to reduce fuels, increase the productivity of forage for wildlife and livestock.	Maintains but does not improve conditions.	Improves 23,290 acres of vegetative conditions and increases elk and livestock forage.	Improves 17,094 acres of vegetative conditions and increases elk and livestock forage.

MA's	Brief Management Area description	Alternative 1	Alternative 2	Alternative 3
M1	Maintain the present condition with minimal investment for resource activities, while protecting the basic soil, water and wildlife resources. Timber harvest, such as salvage and firewood removal, may occur where access exists. Forest lands are classified as unsuitable for long-term sustained timber production.	Maintains present conditions. May not protect basic soil, water and wildlife resources with fire event.	Provides measure of protection to soil, water and wildlife resources by increasing resiliency and heterogeneity.	Provides measure of protection to soil, water and wildlife resources by increasing resiliency and heterogeneity.
R1	Provide a variety of semi-primitive and primitive non-motorized recreation opportunities. Forested lands...are unsuitable. Prescribed fire with planned ignitions may be used...for the enhancement and maintenance of resources.	No change to recreation opportunities.	No change to recreation opportunities.	No change to recreation opportunities.
T1	Provide healthy timber stands and optimize timber growing potential over planning horizon. Lands are suitable for timber production. Even-aged stands will be scheduled for final regeneration harvest when they generally have reached the culmination of mean annual increment (CMAI).	Does not provide for healthy stands or optimize growth.	Provides 6,543 acres of healthy timber stands. Regen units have reached CMAI.	Provides 4,277 acres of healthy timber stands. Regen units have reached CMAI.
T3	Provide for healthy timber stands and a timber harvest program compatible with wildlife habitat goals. Lands are suitable for timber production. Vegetative diversity will be encouraged.	Does not provide for healthy stands or vegetative diversity.	Increases vegetative diversity and provides healthy stands.	Compatible with wildlife habitat goals.
T4	Maintain healthy stands of timber within the visual quality objective of retention and partial retention. This management area is suitable for timber management activities.	Does not provide for healthy stands.	Maintains healthy stands within visual quality objectives.	Maintains healthy stands within visual quality objectives.
T5	Maintain timber sites cost-effectively, by selecting the most economical harvest system and managing for natural regeneration. Lands are suitable for timber production.	Does not maintain timber sites cost effectively.	Long-term cost effective; future ability to manage stands.	Long-term cost effective; future ability to manage stands.
W1	Optimize wildlife habitat potential, including old growth, over the long-term. Timber will be harvested only if it can be used as a tool to maintain or enhance wildlife habitat values. Land is classified as unsuitable for long-term sustained timber production.	Does not optimize wildlife habitat potential.	Provides for wildlife habitat potential.	Best provides for wildlife habitat potential.

MAAs	Brief Management Area description	Alternative 1	Alternative 2	Alternative 3
W2	Provide for other resource uses, if they are compatible with wildlife and livestock objectives. Land is unsuitable for long-term sustained timber production. Harvest will be used only to maintain or enhance wildlife habitat values.	Does not enhance wildlife habitat values.	Provides for wildlife habitat potential.	Best provides for and enhances wildlife habitat.
Forest Plan Objective		Alternative 1	Alternative 2	Alternative 3
Management activities will increase timber productivity on suitable timber land.		Does not increase timber productivity.	Increases productivity on 6,543 acres.	Increases productivity on 4,277 acres.
The sale program depends on managing suitable acres with stocking control techniques, such as pre-commercial and commercial thinning, and...managing insect or disease outbreaks.		Does not manage suitable acres.	Manages 6,543 acres with stocking control techniques.	Manages 4,277 acres with stocking control techniques.
Timber management activities and projects will be coordinated with other resources through an interdisciplinary process.		Does no timber management activities.	Alternatives were designed/coordinated by an IDT.	Alternatives were designed/coordinated by an IDT.
Provide a sustained timber yield that is responsive to local industry and national needs.		Does not provide a sustained yield.	Provides 6,543 acres of yield to local industry.	Provides 4,277 acres of yield to local industry.

Bureau of Land Management Resource Management Plan Consistency

As part of the Tennmile – South Helena project, a variety of vegetation and prescribed burning treatments are proposed on approximately 1,043 acres of BLM lands administered by the Butte Field Office (BFO). The Resource Management Plan (RMP) provides a single, comprehensive land use plan to guide management of public lands as administered by the BFO. The plan provides goals, objectives, allowable uses, and management direction to maintain, improve, or restore resource conditions and to provide for long-term economic needs of local communities.

The BFO RMP goals and objectives only apply to proposed activities located on BLM lands. The actions proposed in this project are consistent with the BFO RMP. BFO RMP goals pertaining to the Tennmile – South Helena Project include: FM1, FM2, FW1, FW2, FW3, and FW4.

- FM1- Provide an appropriate management response to all wildland fire, emphasizing firefighter and public safety.
- FM2- Move towards restoring and maintaining desired ecological conditions consistent with appropriate fire regimes.
- FW1- Restore and/or maintain the health and productivity of public forests, to provide a balance of forest and woodland resource benefits, as well as wildlife and watershed needs to present and future generations.

- FW2- Manage forestry resources to provide a sustained flow of local social and economic benefits and protect non-market economic values.
- FW3- Maintain and/or improve sustainability and diversity of woodland communities to meet ecological site potential.
- FW4- Manage dry forest types to contain healthy, relatively open stands with reproducing site-appropriate, desired vegetation species

Fire and Fuels

Introduction

Fire was historically the predominant natural disturbance in the Tenmile – South Helena project area and lightning ignitions largely determined where and when fires started (Agee 1993; Baker 2002; Pyne 1982); while indigenous burning is presumed to have occurred at lower elevations within the project area (Kimmerer and Lake 2001). The mixture of forest types found in this analysis area developed under the full range of fire severity; low, mixed, and replacement fire severity, varying with moisture, temperature, and vegetative composition.

Based on research performed at larger scales, in general low elevation dry forests in the Northern Rockies have experienced changes in disturbance processes, structure, and function. Causes of change include fire suppression, forest management, and climate change (Hessburg and Agee 2003; Hessburg et al. 2005; Westerling et al. 2006). The combination of fire suppression and exclusion of fire and other natural disturbance processes have allowed fuels to accumulate in fire-excluded forests at both a landscape and stand level. As a result, of higher fuel loading, unusually severe fires in historically mixed-severity and nonlethal fire regimes have been linked to effects of fire exclusion (Agee 1993; Barbouletos et al. 1998; Barrett 1988). Successful suppression, in the last century, and the mountain pine beetle epidemic, has allowed fuels within the analysis area to accumulate to higher fuel loads.

The Tenmile - South Helena Vegetation Project is designed to improve conditions for public and firefighter safety in the event of a wildfire and to maintain consistent quantity and quality of water within the municipal watershed. In order to achieve these purposes, there is a need to create a mosaic of vegetation and fuel structure more resilient to disturbance which would provide for safer, more effective fire suppression actions. Reducing severity of wildfires and increase fire suppression effectiveness would improve protection measures for surrounding communities and key municipal watershed infrastructure. These actions would likely reduce post-wildfire watershed impacts in the Tenmile municipal watershed.

The Tenmile – South Helena Analysis Area can be characterized as having several different forest types within the analysis area resulting in different fire severity regimes ranging from low severity to high severity, stand-replacing:

The western half of the project area, Tenmile Watershed, is characterized by productive lodgepole pine growing on Douglas-fir and subalpine fir habitat types that were initiated by wildfire prior to 1900. Over the last century the homogeneity of the forest has not

been substantially fragmented by modern timber harvest or wildfire. With the exception of limited areas, the landscape became characterized by densely growing mature lodgepole pine trees. As a result, the mountain pine beetle (MPB) outbreak caused extensive mortality peaking in 2009, affecting all mature lodgepole pine stands with intensities greater than 90 percent mortality in some stands. There are also stands mixed with Douglas-fir, subalpine fir, and/or Engelmann spruce, and limited areas dominated by these species as well as natural meadows.

The eastern half of the project area, South Helena Landscape, contains a lesser amount of lodgepole pine compared to the Tennmile Watershed, and is principally characterized by dry Douglas-fir and ponderosa pine forests intermixed with grasslands. These drier vegetation types historically would have burned with relatively high frequency. The lack of natural fire in this landscape has resulted in a buildup of surface fuels, ladder fuels (small trees) and conversion of seral types such as ponderosa pine to more shade tolerant species such as Douglas-fir. The MPB outbreak caused mortality to the majority of mature ponderosa pine, adding additional fuel loading to these dry forests.

Fuels treatment planning and implementation may return some stands to lower fuel loading levels and aid in suppression of future fire starts, protection of values at risk, and assist with overall forest health. Reducing fuel loadings within treatment units would result in modifying existing fuel profile as well as enhance fire suppression capabilities, effectiveness, and firefighter and public safety in the area. Although general wildfire control efforts may not benefit from fuel treatments during extreme fire behavior, fuel modifications can significantly change outcome of a wildfire within a treatment area (Reinhardt et al 2008).

Treatment units have been strategically located and designed to modify fire behavior and complement existing wildfire response strategies and tactics in the Tennmile watershed. Treating 20-40% of the landscape would be expected to be effective at modifying watershed/landscape fire behavior if the units are placed strategically, randomly placed units would require a greater percentage to be effective (Finney 2015). Additionally, units were strategically located along ridgelines, valley bottoms, and in conjunction with natural openings/barriers, and roads/trails which would allow for safer, more efficient implementation of prescribed fire. Historically the South Helena portion of the landscape has been subject to more treatments focused on fuel reduction due to the proximity to the City of Helena. This report describes and analyzes the fire and fuels resources including their existing condition as they pertain to the Tennmile - South Helena project as well as analysis on proposed fuel treatments and effects of treatments by alternative.

The proposed Tennmile - South Helena project would help meet the Forest's Land and Resource Management Plan (HNF Plan) goals and objectives to ensure diverse and sustainable forest stands and habitat in the future, reduce the probability of high intensity wildfire, and maintain or improve watershed values. Reducing current standing dead and down fuel loadings within treatment units would result in modifying existing fuel profile resulting in enhanced fire suppression capabilities and firefighter and public safety in the area.

Assumptions

When completing an analysis of a dynamic environment, at this scale, some assumptions are necessary from an efficiency stand point. The following are some assumptions used in this analysis:

- Fuels data used in this analysis are assumed to represent current on-the-ground conditions. Efforts were made to ensure fuels data accuracy which included; field verification, and incorporation of remote sensing technology. At the time this report was written, no large-scale or catastrophic events were known to have occurred since the data for this project was compiled.
- GIS data used in this analysis is assumed to be accurate to within acceptable standards. This includes ownership boundaries, stand delineations, project and analysis area boundaries.
- Modeling of fire behavior dynamics gives a reasonable estimate of how fire behavior would respond to fuels treatments.

Information Used

Inputs for fire behavior analyses were derived from a variety of sources including HLCNF VMap-, Forest Inventory and Analysis (FIA) grid intensification data, published literature, calibration analyses, and site visits that reflects the most current information available. Refer to the Forested Vegetation report introduction for more information regarding VMap and FIA inventory data.

- HLCNF VMap – Elevation, aspect, and slope were derived from a digital elevation model and were coupled with VMap data. VMap provides species dominance types and canopy cover data important for classifying fire behavior fuel models.
- Fire Family Plus – Weather, wind, and fuel moisture files were prepared using Fire Family Plus. Weather and fire history data was acquired through Western Regional Climate Center (WRCC) and Kansas City Fire Access Software (KCFASST) for Galena Remote Automated Weather Station (RAWS) for July 1993 through September 2013.
- Field Data – Statistically valid data is housed in the FSveg database. Data includes landscape-level FIA plots, grid intensification plots and 50 additional plots. All plot data is stored in FSveg. The Summary Database provides statistically valid estimates. FSveg also houses stand examination data. These are statistical plot surveys taken at the stand-level, measuring stand characteristics such as tree species, heights, diameters, physical defects and insect and disease activity. These data are used to statistically summarize vegetation conditions at appropriate scales. The data is also used for Forest Vegetation Simulator (FVS) modeling and provides surface fuel loading data and canopy data important for fire behavior analyses. Plot data and photos were utilized for checking the accuracy of fire behavior fuel models.
- Landscape Treatment Designer (LTD) - Initial proposed treatment areas were identified using previous on the ground work and the Landscape Treatment

Designer (LTD) tool. LTD incorporated predicted fire behavior of modeled crown fire type and flame length, additionally, LTD incorporated resource specialist constraints. This effort identified strategic areas to consider that met the specified criteria of specialist constraints and areas with high intensity fire behavior as it relates to crown fire and flame length. Once initial areas were chosen field visits were conducted on the majority of the proposed areas and further refined based on observed conditions, feasibility of being able to access and effectively treat areas, and forest plan standard requirements. LTD utilized the best available science and data.

- This analysis is based on results from model runs executed with FlamMap 5 Version 5.0.1.9. Personal knowledge and peer reviewed reports of fire behavior and characteristics in Mountain Pine Beetle (MPB) killed timber were also used in determining fire effects. Initial Fuel Models were determined by onsite evaluations of the project area and units as well as in consultation with the Rocky Mountain Research Station/Fire Science Lab (RMRS). Fuel model and fuel model proportions are presented in this report and represent current conditions. Fuel conditions will continue to change as beetle caused mortality continues to fall. Fuel loading was factored to determine which fuel model from the “Standard Fire Behavior Fuel Models: A Comprehensive Set for Use with Rothermel’s Surface Fire Spread Model” best mimicked the expected fire behavior.

Tenmile Watershed Collaborative Committee Recommendations to City of Helena Commission submitted June 17, 2009. The fuels recommendations include:

- Endorse Finney’s 20-40% of landscape treatment model; utilize the interdisciplinary team (IDT) approach to designate the areas and prescriptions for prescribed fire treatment envisioned by the model.
- The group endorses Finney’s view that all units treated require the use of prescribed fire as a component to achieve the desired impact. Based on IDT evaluation, some sites may require forest fuel modification and/or removal prior to burning. In roaded areas, use of heavy equipment is acceptable to achieve this purpose.

Tri-County Community Wildfire Protection Plan (CWPP). The Tri-County CWPP was used to define wildland urban interface within the project area, and to determine acres in designated risk areas.

City Resolution No. 3013 – 101, a resolution supporting the Lewis and Clark County Fire Council and member fire departments. The County Commissioners of Broadwater, Jefferson, and Lewis and Clark Counties unanimously approved a Resolution that places firefighter safety above structure protection. The Resolution “supports all fuel mitigation efforts that improve the survivability of structures and enhance the safety of our firefighters” and “all departments evaluate the most practical and safest way to provide fire suppression services throughout Lewis and Clark County.

Lewis and Clark County Emergency Operations Plan address objectives that will provide the greatest protection of life during emergencies or disasters in which precautionary evacuations are recommended. The plan lays out ways to strategize residential evacuation in the event of a wildfire. Lewis and Clark County Disaster and Emergency Service and

Lewis and Clark County Fire Council recommended unit placement to delay fire spread allowing for timely and safe evacuations.

Scientific Accuracy/Methodology

This section describes the fire/fuels resources within the project area. Information and data included in this section is from field reconnaissance by local and regional fire management staff and crews. Mapping and statistical information was prepared utilizing a GIS system modified with field data as well as database queries. The information produced in GIS for some of the analysis area depicted conditions that slightly deviated from information gathered through field surveys. Some of the data used for analysis has been modified to better represent onsite conditions.

This analysis is based on the best available science at the time of report completion and acknowledges that there may be incomplete and unavailable information. The spatial and temporal bounds of this analysis are designed to capture the existing condition and effects of action alternatives. Project area effects analysis focuses primarily on the treatment units. Spatially and temporally, the existing condition utilizes the most recent information available, and analyzes the effects over short (present-10 years) durations.

All tables presented in this report have acres and proportions rounded to the nearest whole number. In cases where rounding resulted in the outcome being slightly less or more than the actual total an acre(s) or percent was added to or taken away from the largest value. Fire behavior outputs have been rounded to the nearest 1/10th. Raw data are available in the project file.

Refer to the Tenmile – South Helena Forested Vegetation Report for additional information used, methodologies and scientific accuracies as it relates to VMAP, FIA, and FS Veg.

Refer to Air Quality Report for smoke emissions and Soils Report for burn severity and effects to soils.

Fire behavior analyses were conducted using weather and fuel moisture data from 2000 when the Boulder-High Ore fire occurred. The conditions modeled represent weather and fuel moisture under which the High Ore Fire exhibited large growth adjacent to the Tenmile - South Helena Project area. The intention of the fire behavior analyses is to provide an evaluation of the potential fire behavior and fire effects if a wildfire occurs.

Live woody, live herbaceous, and 1-, 10-, and 100-hr timelag fuels (all dead fuels less than 3 inches in diameter, refer to glossary) represent fuel moistures during mid-July through August of 2000 when the Boulder-High Ore fire started. These values came from the Galena RAWS (Remote Automated Weather Station) located on the Beaverhead Deerlodge National Forest between Whitehall and Boulder, MT. The fuel moisture values during late-September of 2009 when the MacDonald Pass Fire and late-June of 2012 when the Corral Fire occurred were examined as well, but these fires occurred under more moderate conditions with higher fuel moisture values.

Standing dead fuel loads for lodgepole pine were calculated with the R1 conversion factor used in the timber sale appraisal worksheets. Data for this calculation came from

50 randomly placed plots within the project area, data was collected between September 2013 and September 2014. The purpose of this is to identify how fuel loadings and conditions are likely to change as standing dead falls to the surface.

It is impossible to forecast the fire suppression strategy that will be utilized when the next wildfire occurs in this landscape. Fire management options are outlined in Appendix R of the Forest Plan (1986) and offer a wide array of management possibilities. Therefore, an underlying intention of this analysis is to explore if post-implementation vegetation and fuels conditions provide additional fire management options and improve firefighter safety (appropriate management response) by modifying potential fire behavior and fire effects in line with the rationale set forth by Reinhardt et al. (2008).

Fuel Models

A fuel model is a set of fuelbed inputs needed by a particular fire behavior or fire effects model. Scott and Burgan (2005) “Standard Fire Behavior Fuel Models: A Comprehensive Set for Use with Rothermel’s Surface Fire Spread Model” was used to best mimic the expected fire behavior within the treatment units for all alternatives. Mathematical surface fire behavior and fire effects models and prediction systems are driven in part by fuelbed inputs such as load, bulk density, fuel particle size, heat content, and moisture of extinction. To facilitate use in models and systems, fuelbed inputs have been formulated into fuel models. All fuel models have been predicted based on existing vegetation, expected fire behavior, field validation, and professional expertise. Fuel models are a required component for fire modeling. Existing vegetation used in fire models incorporates those changes to vegetation as a result of a combination of natural processes (for example, succession, growth, wildfire, windthrow, insect and disease cycles) and human-induced processes and activities (for example, timber harvest, grazing, fire suppression, prescribed fire).

FlamMap 5

FlamMap 5 is a two-dimensional, non-temporal fire behavior modeling system. It is a spatial fire behavior model that creates calculations (for an instant in time) for all points in the analysis area, using one set of wind and fuel moisture conditions. FlamMap 5 exists as a stand-alone computer program and is a well-known and recognized fire behavior model.

Expected fire behavior can be compared between the alternatives and existing condition. The assumptions underlying the fire spread model assume homogeneity in what is naturally a dynamic system. It is therefore crucial to combine model outputs with professional judgment to ensure the results are valid and believable (Williams and Rothermel 1992). All model outputs were validated by Helena Ranger District fire management personnel. Model inputs include fuel loadings, fuel moisture, foliar moisture, winds (20-ft windspeed plus wind adjustment factor), air temperature, slope, and vegetation information (canopy top height, canopy base height, canopy cover and canopy bulk density). Outputs include surface rate of spread, flame length, heat per unit area (Btu/ft²), and fireline intensity.

The model outputs show the predicted change for a single point on the landscape and not a combined spatial fire behavior scenario. As a result, as fire intensity increases the

models tend to underestimate actual fire behavior because it doesn't factor in combined/cumulative radiant heating into the prediction as addressed in Scott and Reinhardt (2001).

Fire and Fuels, Affected Environment

Introduction

Wildland fire spread is affected by three primary factors; topography, weather, and fuels. In wildland fire, fuel is all combustible plant-derived material including grass, litter, duff, down dead woody debris, exposed roots, plants, shrubs, and trees. This plant-derived material can be dead or alive. Plant parts that are not consumed, such as the trunks of live trees, are not considered fuel. These factors are used to predict fire behavior in areas by taking into account topographic inputs, predicted weather, and known or representative fuels conditions for a site or landscape. Weather and topography are fixed environmental factors that cannot be manipulated for the purpose of effecting fire behavior. Fuels on the other hand, can be changed. Fuels are the only component of fire we have the ability to manipulate to modify fire behavior.

Analysis Area

The Tenmile - South Helena project boundary serves as the area for fire and fuels analysis. The Tenmile—South Helena Project area encompasses approximately 61,395 acres in Lewis and Clark, Powell and Jefferson Counties. This includes approximately 49,546 acres of National Forest System Lands (NFS), 1,043 acres administered by the Bureau of Land Management (BLM), with the remaining acres being private lands or other jurisdictions. The analysis area includes all proposed activities and their effects. The spatial scale of cumulative effects analysis should be consistent with the terrestrial or aquatic processes that can be reasonably affected by the proposed treatments, for this reason the cumulative effects boundary is set at the project boundary. The project area is located within the Upper Tenmile watershed, the primary source of municipal water for the City of Helena, and extends east through Colorado Gulch and the South Hills area of Helena, Montana. The proposed action describes activities on NFS lands in Grizzly Gulch, Orofino Gulch, Corral Gulch, Tenmile Creek, Banner Creek, and Beaver Creek; and on BLM lands in Colorado Gulch and south of Helena in Last Chance Gulch. The majority of these areas fall within the WUI.

Existing Condition

Fire History's role in Current Vegetation Conditions

Fire was historically the predominant natural disturbance in the Tenmile – South Helena project area and lightning ignitions largely determined where and when fires started (Agee 1993; Baker 2002; Pyne 1982); while indigenous burning is presumed to have occurred at lower elevations within the project area (Kimmerer and Lake 2001).

Fire frequency determines vegetation successional stage and fuel conditions and past fire shape and size play a role in fuel connectivity and landscape heterogeneity or homogeneity (Arno et al. 2000, Turner et al. 1998).

Historic fire disturbances have been quantified for the HLCNF using a coarse-filter approach which analyzed the pattern of fire disturbance that would have historically burned prior to settlement by European Americans (Hollingsworth 2004). Burning by Native Americans was considered part of the historic fire regime. This analysis found that Forest-wide, historically 156,615 to 792,330 acres would have burned per decade (Hollingsworth 2004). While fire exclusion aided by cool moist climate conditions resulted in acreage burned well below historic levels prior to 1970, more recent decades are approaching historic levels of acreage burned despite fire suppression efforts in part due to warmer, drier climate conditions. The historic analysis also showed results for each landscape on the HLCNF. The Divide landscape, where the Tenmile – South Helena project is located, historically would have burned an average of 39,124 to 170,242 acres per decade (Hollingsworth 2004). These fires would have included low to moderate intensity in dry conifer fire groups and stand-replacing fire in moist conifer fire groups. Fire occurrence data indicate that essentially no large fires have occurred on this landscape in the last century.

The South Hills portion of the project area (the eastern part) is lower in elevation, and is a landscape of large grasslands and dry forests. Historically, many dry coniferous forests were shaped by frequent, low-intensity fire; this included the warm, dry as well as moist Douglas-fir habitat types of the Tenmile – South Helena project area. This disturbance regime sustained open, large-tree dominated structures with diverse and productive understory communities (Arno 1980, Hessburg and Agee 2003).

Based on research performed at larger scales, in general low elevation dry forests in the Northern Rockies have experienced changes in disturbance processes, structure, and function. Causes of change include fire suppression, forest management, and climate change (Hessburg and Agee 2003; Hessburg et al. 2005; Westerling et al. 2006). Changes include higher tree density, more multi-storied stands and ladder fuels, and a greater homogeneity of structures across the landscape which result in a greater probability for disturbances to affect large contiguous areas (Hessburg et al. 2005). Forest types with naturally high fire frequencies and mixed severity regimes, primarily ponderosa pine and Douglas-fir, have been altered substantially (Hessburg et al. 2005). The forest conditions described by research in the Northern Rockies are observed in the forest vegetation within the project area. Fire in dry forests has shifted from low-intensity, high frequency regimes to moderate and high-severity regimes, with consequent increases in uncharacteristic large-scale stand-replacing fires (Lehmkuhl et al. 2007). Landscapes are increasingly homogeneous in composition and structure, and the regional landscape is set up for severe, large fire and insect disturbance events (Hessburg et al. 2005). The role of fire as a stand replacement agent becomes more pronounced when the natural fire-free interval is increased through fire suppression.

Fire, whether natural or human caused, has been a key process in reducing the surface, ladder, and crown fuels that reduce susceptibility to the adverse effects of severe wildfires. Fire has been the major influence on vegetation patterns, composition, structure, function, age and development of both individual stands and the larger landscape (Arno 2000). Agee (1993) added that changing land use patterns and attempts to exclude fire have succeeded in greatly reducing the scope of fire on the landscape. Many ecosystems within and adjacent to the project area have excessive fuels

accumulation due to years of fire exclusion. These fuels have built up at various rates depending on conditions and past treatments.

Many small wildfires occur on the HLCNF annually; 42 fires occur every year including all lands the HLCNF has administrative jurisdiction over for fire protection. A total of 194,173 acres have burned within the HLCNF administrative boundary since 1970 including private in-holdings, with a total of 537,690 acres having burned across all ownerships where a portion burned on the HLCNF. These wildfires burned on private, state, BLM and other National Forest Land as well as on the HLCNF. Since 1984, seven large wildfires have occurred. The occurrence of large fires increased in the 1980s, consistent with a trend throughout the West (Westerling et al. 2006). None of the large fires to date have burned in the Divide landscape area. The only significant fire to occur in the area was the MacDonald Pass fire of 2009, which burned roughly 170 acres.

Table 50. Major historic fires on the HLCNF since 1970

Fire Name	Year	Acres Burned	Landscape
North Hills	1984	26,950	Big Belt Mountains
Canyon Creek	1988	211,490	Blackfoot/Bob Marshall
Warm Springs	1988	46,900	Elkhorn Mountains
Cave Gulch	2000	29,024	Big Belt Mountains
Maudlow/Toston	2000	81,687	Big Belt Mountains
Snow/Talon	2003	37,405	Blackfoot
Meriwether	2007	46,298	Big Belt Mountains

Since 1920, 434 fires have occurred within the project area and approximately 51 percent have been caused by humans. Although many fires had no accompanying written information and therefore were not included in fire occurrence maps, this data does give a glimpse of the fire suppression history in the area. Fires that escaped detection would not be included. Fire occurrence data was digitized as point source data from historical maps that portrayed fires by year, size class, and cause for 1920 to 1969. For the period from 1970 to present, fire occurrence information was developed from Kansas City fire database (KCFast). Records from this period have detailed information including acreage, cost, and physical location. From 1970 to present more detailed records have been maintained that include acreage burned. In summary, less than 425 acres have burned since 1920 which is equivalent to less than 1 percent of the project area. Fire suppression in the area has been very successful, with only one fire growing to over a hundred acres.

Table 51. Fire occurrence from 1920 through 2015 within project area

Decade	Size		Cause	
	<10 Acres	>10 Acres	Lightning	Human
1920-1929	26	1	6	21
1930-1939	57	2	21	38
1940-1949	28	0	16	12
1950-1959	50	1	32	19
1960-1969	53	1	36	18
1970-1979	57	2	36	23
1980-1989	37	0	19	18
1990-1999	57	1	28	30
2000-2009	46	1	13	34
2010-2015	17	0	6	11
Total	428	9	213	224

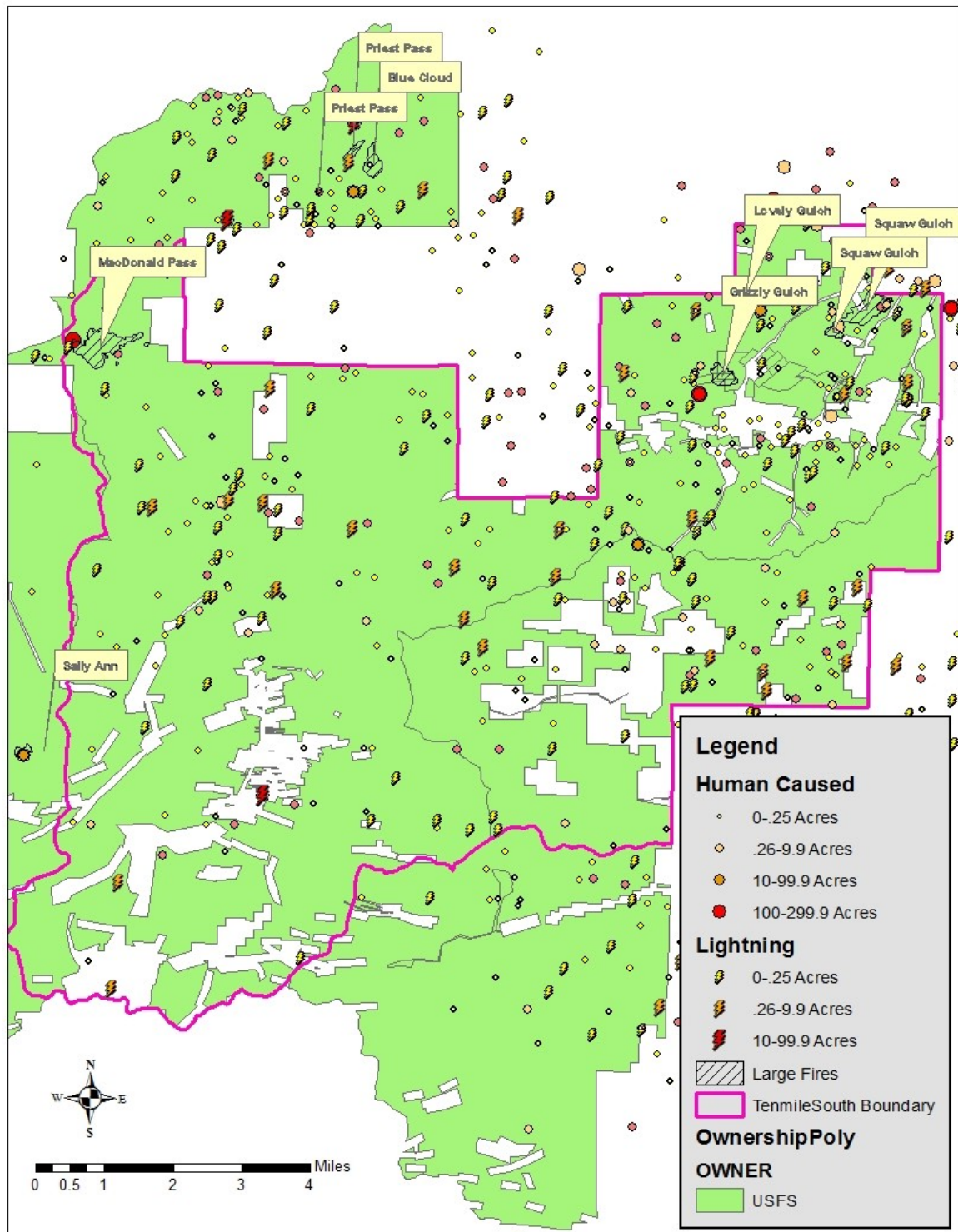


Figure 41. Fire occurrence 1920 to present

Vegetation conditions that exist today in Tenmile watershed (the western part of the project area) were shaped not only by fire suppression, but also climatic trends, large fires that occurred prior to settlement, and fuelwood cutting that occurred around the turn of the previous century to support the mining and railroad industries. Modern timber harvest has also caused some change, although very little harvest has occurred. Fire history maps indicate that much of the area burned in a large wildfire in approximately

1890. Fuelwood cutting for the mining and railroad industries was also common around the turn of the century. The climate early in the 20th century when forests were re-establishing following these disturbances was generally cool and moist, conducive to forest growth. The landscape became characterized by relatively densely stocked stands dominated by even-aged lodgepole pine, with some subalpine fir and spruce at upper elevations and drier Douglas-fir dominated at lower elevations. With the exception of small fires that were suppressed, the homogeneity of this landscape has been largely unbroken. While stand replacement effects would have been typical, there would also have been mixed and low severity fires that left substantial remnant components. The limited areas of past harvest have regenerated and support young forested stands which are less susceptible to bark beetle attack; today these areas stand out as “green forest” areas surrounded by dead and dying trees impacted by the mountain pine beetle.

Over the last century, fire suppression, livestock grazing, and high-grade logging, among other factors, have altered the structure and function of dry coniferous forests across much of western Montana, including the project area. Forest structure and composition has been greatly altered with the lack of fire disturbance; the disruption of the natural fire intervals of the past have resulted in higher stand densities, multi-layered stands of mostly one species, Douglas-fir. Dramatically higher stand densities and development of ladder fuels (Covington and Moore 1994; Arno et al 1995; Peterson et al 2009) increase the risk of uncharacteristically severe wildfire (Everett et al 2000; Friederici 2003), bark beetle infestations (Fettig et al 2007), and in some areas such as the Tenmile – South Helena project area, successional replacement by shade-tolerant competitors (Fischer and Bradley 1987; Mutch et al 1993; Habeck 1994; McKenzie et al 2004).

Fuel Composition within the project area

The greatest effect of fire suppression and exclusion in unison with other natural disturbance processes has allowed biomass to accumulate in most unmanaged timber stands. The bulk of the biomass currently occupying the analysis area is in the form of dead standing and downed trees and shrubs, as well as live shade-tolerant true firs, spruce, lodgepole pine, ponderosa pine, and Douglas-fir. The combination of dead fuel and continuous live vegetation from the forest floor to the upper forest canopy creates a complex of fuel that, when ignited under severe fire conditions, would leave little or no surviving above-ground vegetation. Large legacy trees that are found within the analysis area, that have survived several fires in the past, would be at high risk during a wildfire burning under severe conditions. Fuel composition and how it affects public and firefighter safety and fire management opportunities are discussed in greater detail in the following sections.

Existing fuel conditions are variable across the landscape. Surface fuels are described with a fire behavior fuel model in order to classify fuel conditions for estimated potential fire behavior (Scott et al. 2005). The fuel models defined by Scott and Burgan (2005) were used in this analysis. The project area fuel models are classified as:

Table 52. Fire behavior Fuel Models

Fire Behavior Fuel Model	Approx. Proportions	
	Acres	%

Fire Behavior Fuel Model		Approx. Proportions	
91	Urban/Developed (no fire spread)	567	1%
98	Open Water (no fire spread)	170	<1%
99	Bare ground (no fire spread)	858	1%
101	Short, sparse dry climate grass	484	1%
122	Moderate load, dry climate grass-shrub	379	1%
141	Low load dry climate shrub	5,785	9%
142	Moderate Load Dry Climate Shrub	1	<1%
161	Low load, dry climate timber-grass-shrub	40,652	66%
162	Moderate load, Humid climate timber-shrub	1	<1%
165	Very high load, dry climate timber-shrub	7,301	12%
183	Moderate load conifer litter	883	1%
184	Small downed logs	401	1%
185	High Load Conifer Litter	1	<1%
187	Large Downed Logs	1	<1%
188	Long needle litter	3,759	6%
202	Moderate load activity fuel or low load blowdown	152	<1%
Total		61,395	100%

Public and Firefighter Safety

The project area falls within FMU 1 and FMU 2 (see regulatory framework for description). These FMUs prioritize firefighter and public safety utilizing appropriate management response to resources at risk. Actions most commonly include prioritizing initial attack, and directly attacking fires. For fires occurring in Management Areas H1, H2, and T4 response is rapid and aggressive suppression.

Tree Mortality has occurred throughout the project area. Stand conditions do not allow for safe implementation of non-mechanized fire suppression or treatment options. Current conditions restrict or remove the ability of local fire management to follow established guidance of direct suppression tactics due to increased safety concerns of on the ground resources.

Overhead hazards as a result of dead or disease weakened trees and the difficulty of ingress/egress due to abundant amounts of large downed material make initial attack by ground resources difficult if not impossible and extremely hazardous. Additionally, safety is reduced due to the potential for large quantities of large diameter dead and down material. Establishing escape routes to safety zones is slow and hazardous under these conditions and would have to be done prior to suppression actions. Due to the complexity caused by the fallen trees very experienced saw teams would be required to safely cut in escape routes. Machinery can more safely operate under these conditions, however, fireline construction using heavy equipment, such as dozers, could have potential negative impacts on other forest resources, and could be limited if fire behavior increased. This leaves limited ground resource operation options resulting in heavy reliance of aerial resources; this method increases risk and exposure to these resources as they will have increased flight time to attempt to suppress fire starts with limited ground

support. Effectiveness of aerial resources are diminished within this landscape due to policy [USFS 2011a¹²], topographic features, retardant avoidance area requirements, and existing fuels structure. Lastly, aerial resources are most effective when used in combination with ground resources.

As a result of large quantities of standing dead, an average of 136.6¹³ tons per acre of lodgepole pine across the project area, and existing large diameter down material hand operations are ineffective and largely unsafe. Currently much of the dead material is still standing, however, as time passes this material is falling at an ever increasing rate. It is estimated in the next five years the majority of existing standing dead will be on the ground (Mitchell and Preisler 1998). As this change occurs, it will result in a change in fuel loadings and fire severity as fuels models will shift from low load of litter and down logs, fuel model 161 for example, to high loads of large down logs, fuel model 187 for example. Due to an abundant quantity of presently standing dead, the conditions are such that removing this hazard using hand methods is extremely hazardous and minimally effective. Once standing dead falls to the surface there are additional hazards created including potential for detrimental effects in the event of a fire.

Under existing conditions, to effectively and safely suppress fire and implement treatments, mechanical fuels manipulation and removal are necessary. Burning alone in either situation of standing dead or large quantities of down material would be minimally effective and potentially increase burn severity and hazards. Burning with standing dead in many areas would be largely ineffective as at best there would only be very low intensity surface fire consuming some of the litter and grass/shrub vegetation. A fire of this type would increase the overall hazard for the public and firefighters due to fire weakening existing standing dead trees leaving them susceptible to falling down. Eventually standing dead beetle kill will fall creating heavy loads of dead down material, “jack straw”.

There are important implications of MPB-induced tree mortality on firefighter safety and suppression tactics, including, safety zone size, escape route designation and escape time, and overall suppression strategy that have consequences for wildland fire personnel (Page et al., 2013a). This increase in large fallen dead wood hampers fire suppression as these areas are difficult to walk through and chainsaws are needed to remove layers of logs in order to dig fireline. Dead trees still standing may break and fall during suppression activities endangering firefighters in the area. In the event of a wildfire HLCNF fire management staff would limit and/or restrict ground crews due to safety concerns related to snags and inadequate escape routes to safety zones as a result of the continuous surface

¹² National direction is set forth in the Record of Decision Guidance for the Nationwide Aerial Application of Fire Retardants on National Forest System Lands signed on December 13, 2011 by the Forest Service Chief. As stated in the Aircraft Operational Guidance; Avoidance Area Mapping Requirements Aerial sections of the decision, retardant drops are not allowed in these mapped avoidance areas due to for threatened, endangered, proposed, candidate, or sensitive species or waterways and their 300-foot buffers.

¹³ Based on data collected from 50 randomly placed vegetation and fuels plots sampled throughout the project area between September 2013 and September 2014. Data is stored in the FS Veg database. A summary of tree data is filed in the project record.

fuel buildup. Fireline construction can be very slow which may limit the success of initial attack.

Wildland Urban Interface

The project area lies within the area analyzed in the Tri-County Community Wildfire Protection Plan (Tri-County CWPP). The Tri-County CWPP was completed in 2015 following implementation of the National Fire Plan and involved a collaborative process including Lewis & Clark County, Jefferson County, Broadwater County, City of Helena, Montana Department of Natural Resources, Forest Service and the Bureau of Land Management. The wildland-urban interface (WUI) data for the Tri-County CWPP was developed by combining the Lewis & Clark County and Jefferson County wildland-urban interface zones and Forest Service Region One Healthy Forest Restoration Act (R1-HFRA) WUI. A wildfire fire risk analysis was completed for the Lewis and Clark, Northern Jefferson, and Northern Broadwater counties (tri-county area). Three principle input layers were used to assess risk of wildfire damage to lands and structures in the tri-county area. The input layers were: fuel hazard risk, fire ignition probability, and wildland urban interface risk (based on proximity to interface communities). Wildland interface zones up to four miles from interface communities (defined in the Federal Register notice of January 4, 2001 as areas where population density ≥ 250 people per square mile), were identified by the tri-county fire planning group as important areas for reducing fuel hazards. Each one mile buffer zone in the four mile area was assigned a WUI risk class of: 4 (very high) for the nearest, 3 (high) for the next, 2 (moderate) for the next, and 1 (low) for the farthest. An additional WUI risk class of: 0 was assigned to areas outside of the WUI zones.

Approximately 97 percent of the project area is classified as WUI (see

Table 53).). Current conditions are such that if a fire occurred in or adjacent to WUI, suppression resources would concentrate on assisting with evacuations, maintaining egress routes and public and firefighter safety. Actions to suppress fire would be limited to more indirect tactics due to existing hazards caused from tree mortality and the large amount of dead down material within WUI. This tactic allows for more ideally placed firelines in lighter fuels using natural barriers to fire and for safer firefighter working conditions in less smoke filled and cooler areas. However, it may also allow for more burned acreage, larger hotter fires, and the possibility of wasted time constructing unused firelines. Implementing such indirect strategies typically requires more time and resources.

Table 53. Wildland-Urban Interface within the Tenmile-South Helena Project Area

WUI Class	Acres	Percent of Project Area
Low	5396	8.8%
Moderate	16,837	27.4%
High	21,804	35.5%
Very High	15,261	24.9%
Outside WUI	2,099	3.4%
Total	61,397	100%

Table 53 represent proximity and density of residences. Approximately 60.4 percent of the WUI is classified as having either high or very high value. Fire management strategies are often limited within WUI, as care must be taken to protect private property.

Of the approximate 97 percent WUI within the project area all of the Lazyman Gulch Inventoried Roadless Area (IRA) is classified as WUI and 97 percent of the Jericho Mountain IRA is classified as WUI, Table 54 contains a detailed breakdown of WUI class within each IRA. These areas contain forest conditions that aid in the spread of fire within the WUI zone. As discussed in the National Cohesive Wildland Fire Management Strategy treating areas within the WUI is a way to develop fire adapted communities, restore and maintain landscapes, and respond to wildfires (USDA and DOI 2014).

Table 54. Amount of WUI that falls within Inventoried Roadless Areas

WUI Class	Jericho Mountain		Lazyman Gulch	
	Acres	Percent of IRA	Acres	Percent of IRA
Low	2,066	24	0	0
Moderate	4,374	52	2,168	19
High	1,736	21	7,032	60
Very High	0	0	2,408	21
Outside WUI	264	3 ¹⁴	0	0
Total	8,440	100%	11,608	100%

¹⁴ Located outside the Tenmile – South Helena project boundary.

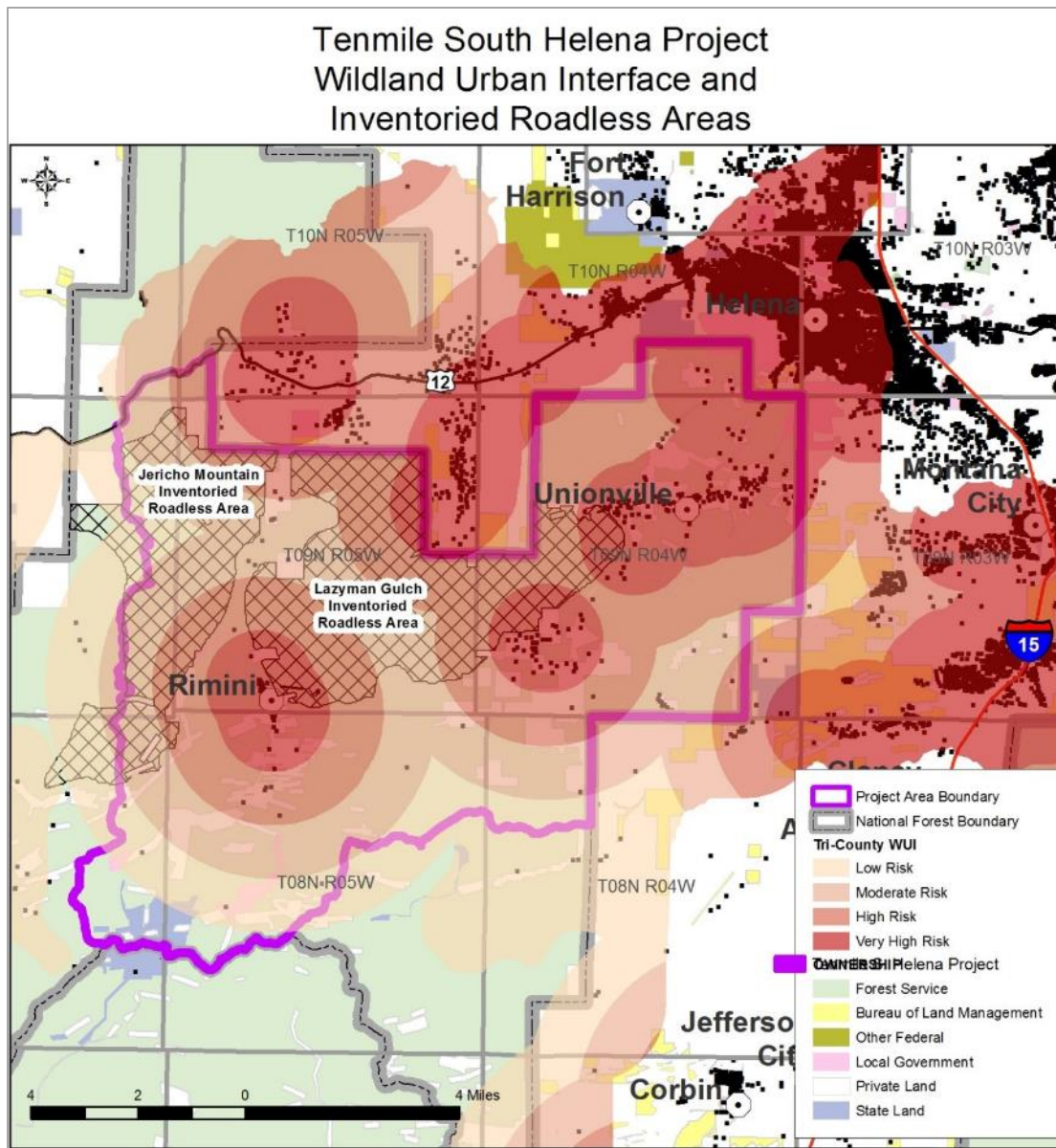


Figure 42. Map of WUI within Tenmile - South Helena Project Area

Forested Vegetation and Fuel Conditions

Douglas-fir and ponderosa pine vegetation type

Historically, many dry coniferous forests were shaped by frequent, low-intensity fire; this included the warm, dry as well as moist Douglas-fir habitat types of the Tenmile – South Helena project area. This disturbance regime sustained open, large-tree dominated structures with diverse and productive understory communities (Arno 1980; Hessburg and Agee 2003). However, over the last century, fire suppression, livestock grazing, and high-grade logging, among other factors, have altered the structure and function of dry coniferous forests across much of western Montana. Forest structure and composition has been most significantly altered with the lack of fire disturbance; the disruption of the natural fire intervals of the past have resulted in higher stand densities, multi-layered stands of mostly one species, Douglas-fir. In addition, the recent MPB epidemic killed a

high percentage of ponderosa pine within the project area, lowering species diversity and skewing the dominance of Douglas-fir over pine. Dramatically higher stand densities and development of ladder fuels (Covington and Moore 1994a; Arno et al 1995; Peterson et al 2009) increase the risk of uncharacteristically severe wildfire (Everett et al 2000; Friederici 2003), bark beetle infestations (Fettig et al 2007), and in some areas such as the Tennmile – South Helena project area, successional replacement by shade-tolerant competitors (Fischer and Bradley 1987; Mutch et al 1993; Habeck 1994; McKenzie et al 2004).

Along with dry grassland parks, Douglas-fir with ponderosa pine dominates the low to middle elevations of the Tennmile – South Helena project area (26,832 acres or 44 percent of the project area). In contrast to early 1900s conditions of open-grown, larger diameter stands of Douglas-fir and ponderosa pine, current Douglas-fir stands in the project area are continuous, mid-successional and densely stocked, and establishing into dry grassland and quaking aspen communities. The increase in extent and continuity of this coniferous vegetation type has effectively reduced landscape vegetation heterogeneity and associated biodiversity and put unique habitat types of the Tennmile – South Helena analysis area (most importantly quaking aspen and seral ponderosa pine communities) at risk of irreversible habitat conversion. High density stands of Douglas-fir have been affected by western spruce budworm and an increase of individual trees killed by Douglas-fir bark beetle has been noted in the analysis area through field surveys. Additionally, mortality of very large ponderosa pine through bark beetles has been noted in the analysis area through field surveys.

Douglas-fir Fuel Condition – Fire Behavior Fuel Model 161, Timber with Short Understory



Figure 43. Example of fuel model 161

FBFM 161 is found on 66 percent of the project area and has low load of grass and/or shrubs with litter under a timber overstory. The understory can consist of grasses, forbs, or short shrubs or any combination thereof. The overstory is often Douglas-fir but can include lodgepole pine or whitebark pine. Ladder fuels are lacking. Flame lengths vary from 1 to 5 feet. Douglas-fir may have an understory consisting of pinegrass, various forbs, or short shrubs such as snowberry

(*Symphoricarpos albus*) and kinnikinnick (*Arctostaphylos uva-ursi*). Historically, fire effects within Douglas-fir stands were variable due to differences in fuel loadings and stand structure combined with changes in weather and topography (Arno 1980). This gradient of fire effects created a diverse, heterogeneous mosaic on the landscape (Arno 1980). Ground and surface fuels, in the form of duff, litter, and fine woody debris were historically consumed by fires (Arno 2000). As the frequency of fires lengthened through the 1900s, due to efficient and effective fire suppression, accumulations of surface fuels

have increased and allowed for fires with increased intensity (Martin et al. 1989; Mutch et al. 1993).

Fuel Condition Influence on Suppression Effectiveness

Lack of down fuel and low density of snags allows for direct attack at the stand level. Recent increase in spruce budworm defoliation has in some areas resulted in an increased red needle canopy which could result in higher intensity crown fire. This scenario would result in indirect suppression strategy. Based on professional experience and observations a fire can easily spread from a small fire in this type to an adjacent stands limiting suppression alternatives.

Fuel Condition and Suppression Influence on Safety

Generally slow burning surface fire. Not a significant concern if fire remains within this fuel type. Ground crews would be effective as long as a transition to crown fire doesn't occur. Access to stand could delay or alter fire suppression strategy.

Ponderosa Pine Fuel Condition – Fire Behavior Fuel Model 188, Long-Needle Litter



Figure 44. Example of fuel model 188

FBFM 188 is found on 6 percent of the project area and represents lower elevations of the Douglas-fir zone that often maintained seral ponderosa pine due to intermittent fires that hindered succession and therefore replacement by Douglas-fir (Habeck and Mutch 1973).

Ground and surface fuels, in the form of duff, litter, and fine woody debris were

historically consumed during the frequent fire interval (Arno 2000). In addition, the frequent fires eliminated many of the seedlings, saplings, and some of the pole-sized timber (Arno et al. 1995). However, as the frequency of fires lengthened through the 1900s, due to efficient and effective fire suppression, accumulations of surface and ladder fuels have increased and allowed for stand replacing wildland fires to become more common (Martin et al 1989; Mutch et al. 1993). Rate of spread is moderate and flame lengths are low.

Given the current conditions within the project area and the dynamics associated with lodgepole and ponderosa pine mortality, untreated areas can be expected to realize higher intensity fires that consume a considerable portion of duff and litter due to current density, stand structure, red needled litter, and stand composition (Agee and Skinner 2005; Graham et al. 2004).

Fuel Condition Influence on Suppression Effectiveness

Majority of large diameter dead material is currently down. Stand is in reinitiating phase with abundance of natural regeneration occurring. Blowdown intermixed with occasional green residuals and heavy regeneration creates a dynamic fuel model which could result

in higher intensity surface fire resistant to suppression. Thick duff layer and fuel loading in excess of roughly 20 tons per acre of 1000-hour fuels allow for long residence time should a fire occur. For this analysis residence time considers all phases of a fire starting from the flaming combustion phase through the glowing combustion phase. Fire suppression costs can be high during this extended mop-up phase to extinguish large dead logs. Expect high intensity fire and high mortality of regeneration. In addition as these large ponderosa pine fall adjacent stands are experiencing blowdown along perimeter too.

Fuel Condition and Suppression Influence on Safety

This type is predominately located in the WUI south of Helena. The typical and desired fire suppression strategy for initial attack on these forest types is “direct attack”. In most cases, this suppression strategy is the safest and most effective tactic, resulting in the least area burned. Fire suppression capabilities would be limited due to safety concerns related to snags and inadequate escape routes to safety zones as a result of the continuous surface fuel buildup. In order to minimize firefighter exposure to the inherent hazards, on-the-ground firefighting would be generally limited to roadways, open live forest canopies, and snag free zones. This reduced suppression capability could potentially lead to more acres burned and increased risk to other resources and the communities in the surrounding area. Fire managers would need to consider indirect suppression tactics.

Mixed Conifer Vegetation Type

In the project area, the mid- to high elevation forest are currently homogeneous mature stands, lacking stand age diversity that comes from past fire disturbances that characterized a more heterogeneous project area. Blister rust and MPB have accelerated succession to subalpine fir and Engelmann spruce by killing mature whitebark pine, and MPB has killed the majority of lodgepole in the project area; this coupled with the lack of fire as a recycling agent has caused a major shift in landscape composition and structure from one of pine to fir and spruce (Keane 2000).

Whitebark pine is a foundation species of high elevation ecosystems, providing snow capture and retention, carbon storage, increasing biodiversity, and serving as a good source for wildlife. Throughout its range whitebark pine is experiencing rapid mortality due to several factors including the exotic white pine blister rust, the native mountain pine beetle infestation, and wildfire exclusion resulting in conifer encroachment (GYCC 2011). Warming temperatures are thought to further increase the rate of mortality due to favorable conditions for white pine blister rust and mountain pine beetle (GYCC 2011).

Fuel Condition Fire Behavior Fuel Model 165, Very high load, Dry climate Timber-Shrub:

The fuel profile associated with dying pine trees within the mixed conifer vegetation type is more complex than that described in the lodgepole pine type. Accumulation of dead fuel would be in juxtaposition with live fuel, rather than the more straightforward accumulation of dead fuel loading with pure lodgepole pine stands. Fires that burn at higher elevations are known to have beneficial effects to whitebark pine with the potential for whitebark pine natural regeneration (Keane et al 1994; Murray et al 2000; Keane 2000; Keane and Parsons 2010).



Figure 45. Example of fuel model 165

FBFM 165 is found on 12 percent of the project area and represents moist site Douglas-fir, mixed Douglas-fir/lodgepole pine, Engelmann spruce, subalpine fir, and whitebark pine/subalpine fir with an understory of tall shrubs and/or conifer regeneration. Additionally, this FBFM includes dry-site Douglas-fir with an understory of grasses mixed with common juniper (*Juniperus communis*). Historically, fire effects within Douglas-fir stands were variable due to differences in fuel loadings

and stand structure combined with the influence of weather and topography (Arno 1980). This gradient of fire effects created a diverse, heterogeneous mosaic on the landscape (Arno 1980). Ground and surface fuels, in the form of duff, litter, and fine woody debris were historically consumed by fires (Arno 2000). In the absence of fire, dense understories choked with regeneration or overstocked pole stands have a tendency to develop (Habeck and Mutch 1973).

Within the Tenmile – South Helena project area, many of the mature whitebark pine have been killed by mountain pine beetle (MPB). An estimated 2,347 acres of scattered whitebark pine that occurs in mixed conifer (lodgepole pine, subalpine fir, Engelmann spruce and Douglas-fir) stands have been killed by MPB. There is a strong relationship between rates of whitebark pine killed by MPB and whitebark pine regeneration density that indicates that stand-scale gap-phase¹⁵ dynamics may be one response to MPB outbreaks (Larson and Kipfmüller 2010). Although project area specific surveys have not been done in whitebark pine, informal field surveys have found whitebark regeneration established under more pure whitebark pine stands with a high component of dead mature trees; though some mature whitebark pine trees persisting in the face of both beetle and blister rust pressure. Whitebark pine occurs most commonly at the highest elevations in the project area, with a few scattered individuals or in smaller (1/4 acre-sized) patches down to the mid-elevations.

Ongoing successional replacement of whitebark pine with the absence of fire may actually be enhanced by blister rust and mountain pine beetle kill; this is especially true where fire exclusion reduces the opportunity for whitebark pine regeneration. Keane et al (1994) found that other conifers replace whitebark pine, in the absence of fire.

Arno and Hoff (1989) reported wildfire is an important process for whitebark pine with fire return intervals from 50 to 300 years in the Northern Rockies, with fires being highly variable in severity and size. Not all ecosystems or all Rocky Mountain landscapes have

¹⁵ Gap-phase' dynamics is defined as where the patchy mortality of mountain pine beetle outbreaks creates numerous forest openings and canopy gaps of varying sizes, which then allows for natural regeneration to become established (Larsen and Kipfmüller 2010).

experienced the impacts of fire exclusion as yet; the lack of impacts may not yet be manifested at the stand level, but are detectable at the landscape level (Keane et al 2002). Whitebark pine survives low intensity fires but still benefits from stand replacing fire where regeneration is most successful. Keane and Arno (1993) suggest that fire is important in perpetuating an abundance of whitebark pine.

Fuel Condition Influence on Suppression Effectiveness

Robust understory vegetation consisting of conifer regeneration, grass and shrub create the potential for high fire intensity with rapid rates of spread. Within these areas the potential for surface fire to move into the crowns is high due to abundant ladder fuels. Additionally, areas with beetle mortality have significant overhead hazards to firefighters that must be mitigated prior to fire suppression actions. As the dead continues to fall there is an increase in surface fuels further adding to the potential for increased resident time of fire in an area. Under these conditions indirect attack is the most likely option to suppress a fire. Fire has a high likelihood to spread into adjacent stands with moderate intensity and moderate rates of spread as a surface fire.

Fuel Condition and Suppression Influence on Safety

Generally, fire in this vegetation type has moderate rates of spread and moderate flame lengths as a surface fire. Indirect attack is the most likely option due higher fire intensity and flame lengths. Access to areas within the project area could delay or further alter suppression strategy.

Lodgepole pine vegetation type

A patchwork of regenerating clearcuts was created with past harvest. Aside from this patchwork, lodgepole forests were homogenous and characterized by dense, mature trees with little age class diversity prior to the MPB epidemic. This homogenous forest type of mature lodgepole fed the MPB outbreak, which peaked in 2009, affecting over 74 percent of the lodgepole and ponderosa pine stands within the project area with intensities of greater than 90 percent mortality in some stands. Every pine stand that is larger than 5 inches in diameter has been affected by the mountain pine beetle epidemic in the project area (an estimated 23,541 acres of lodgepole pine and ponderosa pine with dead or dying trees over the majority of the stand). Stands surveyed in 2014 contained few live mature lodgepole, and found that these forests have transitioned to the “gray phase”; that is, the needles have fallen. Walk-through surveys in the analysis area have also found tree ages of all species range from 80-120 years. Under pure stands of lodgepole pine forested canopies, intermediate and understory trees are rare (mostly suppressed lodgepole pine and Douglas-fir seedlings and saplings) and average 50-70 years old.

Cool habitats dominated by lodgepole pine are common in the Tenmile – South Helena analysis area. Two habitat types represented the broader cool habitat types dominated by lodgepole pine: habitats where lodgepole pine was the climax species and occurred as pure stands prior to climax; and mixed conifer habitats where lodgepole pine was dominant in most stands. Fire disturbances historically characterized the mosaic of lodgepole pine age classes and stand successional that characterized mid to upper elevations in the Tenmile – South Helena area. Habitat types below 7,500 feet experienced more frequent fire than those above this elevation. At lower elevations fire

perpetuated lodgepole pine by eliminating shade tolerant species from stands. Fischer and Clayton (1983) indicate that lodgepole pine-dominated areas occurred in patches ranging from five to hundreds of acres. Elevations above 7,500 feet fires under natural disturbance regimes were more infrequent, lightning-caused fires that burned with mixed fire severity; the result being a patch-mosaic of lodgepole pine size classes (Fisher and Bradley 1987).

Dense lodgepole pine stands dominated cool habitats prior to the MPB epidemic, and were one of the most common vegetation types in the Tenmile – South Helena area. Lodgepole will continue to be the dominant forest type in the near future when the pulse of lodgepole pine regeneration becomes established.

Lodgepole Pine Fuel Condition- Fire Behavior Fuel Models 183, 184, 185, 187



Figure 46. Example of Fuel Model 183

FBFM 183 is found on 1 percent of the project area and has a moderate load of conifer litter and a light load of coarse fuels. (Scott et al 2005) This FBFM includes lodgepole pine, Douglas-fir/lodgepole pine, and lodgepole pine/subalpine fir stands. This FBFM can also represent recently burned areas. Flame lengths are less than two feet with slow rates of spread. This FBFM does not have a ladder fuel component and the potential for fire transitioning from the surface to the crowns is minimal.

Fuel Condition Influence on Suppression Effectiveness

Under existing conditions direct attack is highly likely and would be successful. These areas are generally intact with minimal beetle caused mortality resulting in lighter fuel loads and average overhead hazards from standing dead.

Fuel Condition and Suppression Influence on Safety

With light fuel loading, minimal to no understory and minimal overhead hazards these areas pose average safety risk to firefighters. However, access to and from these areas could hamper or alter suppression strategies and tactics due to having to pass through areas of heavy mortality still standing and accumulating on the forest floor. Low intensity fire with very slow rates of spread can be expected in these areas.



Figure 47. Example of Fuel Model 184

FBFM 184 is found on 1 percent of the project area and has a moderate load of fine litter and coarse woody debris in the form of small diameter logs. (Scott et al 2005) This fire behavior fuel model includes lodgepole pine, Douglas-fir/lodgepole pine, and lodgepole pine/subalpine fir stands that have some degree of mortality in the form of small-diameter logs on the ground such as occur through self-thinning or previous endemic mountain pine beetle activity. Flame lengths of two to three feet characterize this fire behavior fuel model, not quite

reaching the critical surface flame length of nine feet needed for a surface fire to transition to a crown fire. Scorch height is four to five feet. Lodgepole pine that has suffered low mortality is included in this fire behavior fuel model. FBFM 184 does not have a ladder fuel component, dry-site lodgepole pine with an understory consisting of pinegrass or grouse whortleberry (*Vaccinium scopulorum*) is common.

Fuel Condition Influence on Suppression Effectiveness

Small diameter dead material is beginning to fall. Stand is in the early stages of the reinitiating phase with abundance of natural regeneration occurring. Occasional blowdown intermixed with occasional green residuals and regeneration creates a dynamic fuel model transition which could result in higher intensity surface fire resistant to suppression. In addition to fine fuel loads of roughly six tons per acre there is also additional 1000-hour fuels, material great than 3 inches in diameter, present, as illustrated in Figure 47. The combination of fine and 1000-hour fuel loads creates conditions for increased residence time should a fire occur. Fire suppression costs can be very high during this extended mop-up phase to extinguish down logs.

Fuel Condition and Suppression Influence on Safety

With moderate fuel loading and some overhead hazards these areas pose an increased safety risk to firefighters. However, access to and from these areas could hamper or alter suppression strategies and tactics due to having to pass through areas of heavy mortality still standing and accumulating on the forest floor. Low intensity fire with slow rates of spread can be expected in these areas.



Figure 48. Example of Fuel Model 185

FBFM 185 is found on less than 1 percent of the project area and has a high load of fine litter; light slash or mortality fuel (Scott et al 2005). This FBFM, similar to FBFM 184, includes lodgepole pine, Douglas-fir/lodgepole pine, and lodgepole pine/subalpine fir stands that have a higher degree of mortality in the form of small-diameter logs on the ground such as occur through self-thinning or previous endemic mountain pine beetle activity. Flame lengths of two to five feet characterize this fire behavior fuel model, not quite reaching the critical surface

flame length of nine feet needed for a surface fire to transition to a crown fire, although a conditional crown fire is possible in mature stands if a crown fire entered from an adjacent stand. Scorch height is up to 13 feet. Lodgepole pine that has suffered low mortality is included in this fire behavior fuel model. FBFM 185 does not have a ladder fuel component, dry-site lodgepole pine with an understory consisting of pinegrass or grouse whortleberry (*Vaccinium scopulorum*) is common.

Fire intensity is expected to increase due to higher midflame windspeed, increase in 1-hr fuel size class of small branchwood and increase in litter loading within post-epidemic stands as compared to endemic stands (Page and Jenkins 2007). This fire behavior fuel model has varying proportions of dead lodgepole pine, so in some stands a crown fire is not expected due to low canopy bulk density.

Given the current conditions within the project area and the dynamics associated with lodgepole and ponderosa pine mortality, untreated areas can be expected to realize higher intensity fires that consume a considerable portion of duff and litter due to current density, stand structure, red needled litter, and stand composition (Agee and Skinner 2005; Graham et al. 2004).

Fuel Condition Influence on Suppression Effectiveness

Large diameter dead material is continuing to fall down. Stand is in reinitiating phase with an increase of natural regeneration occurring. Blowdown intermixed with occasional green residuals and regeneration creates a dynamic fuel model which could result in higher intensity surface fire resistant to suppression. Fine fuel loading in excess of roughly eight tons per acre as well as increased 1000-hour fuel loads, see Figure 48, allow for longer residence time should a fire occur. Fire suppression costs can be very high during this extended mop-up phase to extinguish large dead logs.

Fuel Condition and Suppression Influence on Safety

With high fuel loading and increased overhead hazards these areas pose an increased safety risk to firefighters. Additionally, access to and from these areas could hamper of alter suppression strategies and tactics due to having to pass through areas of heavy mortality still standing and accumulating on the forest floor. Moderate intensity fire with slow rates of spread can be expected in these areas.



Figure 49. Example of Fuel Model 187

FBFM 187 currently is found on less than 1 percent of the project area and has a heavy load of forest litter, includes larger diameter downed logs. (Scott and Burgan 2005) This FBFM, similar to FBFM 185, includes lodgepole pine, Douglas-fir/lodgepole pine, and lodgepole

pine/subalpine fir stands that have a higher degree of

mortality in the form of large-diameter logs on the ground such as occur through self-thinning or previous endemic mountain pine beetle activity. Flame lengths of two to four feet characterize this fire behavior fuel model, not quite reaching the critical surface flame length of nine feet needed for a surface fire to transition to a crown fire, although a conditional crown fire is possible in mature stands if a crown fire entered from an adjacent stand. Scorch height is up to 10 feet. Lodgepole pine that has suffered high mortality is included in this fire behavior fuel model. FBFM 187 does not have a ladder fuel component, dry-site lodgepole pine with an understory consisting of pinegrass or grouse whortleberry (*Vaccinium scopulorum*) is common.

Fuel Condition Influence on Suppression Effectiveness

Majority of large diameter dead material is currently down. Stand is in reinitiating phase with abundance of natural regeneration occurring. Heavy blowdown intermixed with occasional green residuals and heavy regeneration creates a dynamic fuel model which could result in higher intensity surface fire resistant to suppression. Fuel loading in excess of roughly 20 tons per acre of 1000-hr fuels allow for long residence time should a fire occur. Residence time refers to the total length of time that the flaming front of the fire occupies one point. Large quantities of dead and down material typically burn slowly with very high intensity and are likely to burn and smolder for extended time resulting in increased smoke emissions and increased effects to soils. Fire suppression costs can be very high during this extended mop-up phase to extinguish large dead logs.

Fuel Condition and Suppression Influence on Safety

This type is predominately located in upper elevations of the project area, including Skihi Peak, Black Mountain, Colorado Mountain, Red Mountain, Lee Mountain, Continental Divide, Upper Tenmile and around the Community of Rimini. The typical and desired fire suppression strategy for initial attack on these forest types is “direct attack”. In most

cases, this suppression strategy is the safest and most effective tactic, resulting in the least area burned. Fire suppression capabilities would be limited due to safety concerns related to snags and inadequate escape routes to safety zones as a result of the continuous surface fuel buildup. In order to minimize firefighter exposure to the inherent hazards, on-the-ground firefighting would be generally limited to roadways, open live forest canopies, and snag free zones. This reduced suppression capabilities could lead to more acres burned and increased risk to other resources and the communities in the surrounding area. Fire managers would need to consider indirect suppression tactics (Indirect attack).



Figure 50. Representative Photos of “jackstraw” conditions within Tenmile-South Helena Project Area

Measurement Indicators

Vegetation structure is critical for safe and effective fire management. Additionally, vegetation structure provides information necessary to determine potential severity that may occur in the event of a fire. Vegetation structure is assigned a Fire Behavior Fuel Model number (Scott and Burgan 2005). Fuels are classified based on several factors including type of fuel and amount of surface fuel present.

To focus the fire/fuels analysis and describe relevant effects, the following effects indicators have been used (Table 55):

Table 55. Fire and Fuels Indicators and Units of Measure

Resource Indicator(s)	Quantitative Unit of Measure
Firefighter and Forest Worker Exposure	Acres of Treatment
Tenmile Municipal Watershed Treatment Effectiveness.	Percent of Acres treated in Tenmile Watershed
Treatment Feasibility - Mechanized vs. Hand Treatment	Acres Mechanized Treated, Acres Hand Treated
Flame Length	Percent Change in Flame Length
Fireline Intensity	Percent Change in Fireline Intensity

Firefighter Exposure

Firefighter exposure – standing dead and surface fuels of heavy dead and down materials dictates accessibility to fire starts and safe operability of firefighters once they reach a fire (ability to access and suppress fire). Areas with large quantities of standing dead trees and/or heavy concentrations of dead down material create unsafe and inefficient

conditions for firefighters to perform their duties on the ground virtually removing direct attack as a suppression option. Management direction within the project area requires minimizing acres burned establishing the need for direct attack on fire starts. Reducing firefighter exposure through treatment increases safety for firefighting personnel and the public, this will be compared between alternatives based on the number of acres treated.

Tenmile Municipal Watershed Treatment Effectiveness

Treatment effectiveness can be accomplished through treating 20 to 40% of the watershed landscape. By strategically placing treatments across the landscape it is necessary to treat 20 to 40% of the area for fuels treatments to be effective. If the same amount of area is randomly placed it would be necessary to treat more than 20 to 40% of the landscape (Finney 2015). The percentage of the Tenmile watershed treated will be compared between alternatives to determine overall treatment effectiveness.

Treatment Feasibility

Given the urgency of this project and the need for providing for safety of forest workers¹⁶, feasibility will be determined by the acres of treatment conducted by mechanical versus hand methods. It has been shown that treating areas by hand with high density of standing dead and down material greater than eight inch DBH poses high risk to forest workers and is very time consuming, as shown with the Red Mountain Flume project implementation production rates are 8 acres per month using a 20 person hand crew. Treatment feasibility is determined by treating more area utilizing mechanical equipment over hand treatment for the purpose of safety, timeliness, and cost effectiveness. Treatment feasibility encompasses a variety of factors (i.e. economics, accessibility, topography, etc...). For this purpose treatment feasibility only considers safety to forest workers.

Under current conditions mechanized equipment is necessary to achieve fuels modifications and reduction. This is a result of the abundance of standing dead trees that pose an eminent hazard to hand operations. Additionally, due to the large quantities of dead down material equipment is necessary to remove and or re-arrange the fuels prior to any type of prescribed fire.

Predicted Flame Length (Feet)

Flame lengths are important to determine fire suppression techniques. Within this analysis flame lengths will be utilized as a measurement indicator to determine potential fire management strategies and tactics. If flames are over 4 feet, suppression with hand crews is generally unsuccessful and could require mechanized equipment. If flame lengths are over 8 feet, mechanized equipment is not considered an effective suppression tool; this is known as the Hauling Chart and is used in standard practice by fire managers (Andrews et al. 2011). Flame lengths above 8 feet require indirect strategies and tactics

¹⁶ Forest Workers include contractors, volunteers, state and federal employees and any other person or group that performs official work on federal lands.

and an increased reliance on aviation resources. Changes in flame lengths will be displayed for each action alternative.

Fireline Intensity

Fireline Intensity is the heat energy release per unit time from a one-foot (one-meter) wide section of the fuel bed extending from the front to the rear of the flaming zone. Fireline intensity is a function of rate of spread and heat per unit area, and is directly related to flame length. (BehavePlus 2009). Fireline intensity captures the flaming combustion phase of residence time. Reducing fireline intensity lessens the potential for fire severity to associated resources (see Soils and Forested Vegetation specialist reports). Reduction in intensity can also be related to increased ability of firefighters to suppress and manage fire. Changes in fireline intensity will be displayed for each action alternative. Changes in fire severity are addressed in the Soils, Hydrology and Forested Vegetation specialist reports.

Fire and Fuels, Environmental Consequences

Introduction

This analysis considers feasibility and effectiveness of proposed fuel treatment activities in addition to treating 20-40 percent of Tennmile Watershed minimizing firefighter exposure and modifying Fire Behavior.

The proposed fuel reduction techniques focus on reducing the potential for crown fires and high intensity surface fires in treatment units, and thus reducing the resistance to control and maintaining forest health. Thinning of trees would reduce the crown density. Removing understory trees would also increase the canopy base height, making it more difficult for a crown fire to be initiated. Thinning would primarily focus on removing standing dead, smaller diameter trees and species that are less resistant to fire, leaving larger, fire resistant species where possible. Prescribed burning will also be utilized to remove fine fuels and to restore fire to the landscape.

The combination of these efforts will move treated units closer to historical condition by creating a mosaic of age class, stand structure, and reintroduction of fire. Reinhardt et al (2008) found that it is possible to craft treatments that achieve both ecological restoration and fire hazard reduction, but ecological restoration will also include reintroducing fire and other active management. The most effective ecosystem treatments should include prescribed fire (Reinhardt et al 2008). Treating the proposed areas will reduce existing and future hazards to firefighters and the public. Additionally, treating 20 to 40 percent of the watershed with strategically placed units (Finney 2015) will restore heterogeneity to the landscape. Treating these areas will increase the opportunity for direct fire attack suppression and provide increased opportunities for indirect attack around untreated portions of the project area. The overall result would lead to reducing the overall intensity of fires. To focus the fire/fuels analysis and describe relevant effects, the following indicators are used.

- Firefighter Exposure
- Tennmile Municipal Watershed Treatment Effectiveness.

- Treatment Feasibility - Mechanized vs. Hand Treatment
- Predicted flame length (feet).
- Fireline Intensity (BTU/Foot/Second).

The post treatment fuel model in each unit was compared to the existing condition (displayed in Alternative 1) fuel model by flame length, and fireline intensity in the following tables. FLAMMAP was used to run a simulation of fire behavior on the 97th percentile weather day¹⁷. The simulation produces 97th percentile fire behavior indicators by treatment type. The results are derived from an overall average of the median values for all individual treatment types that are proposed within the Tennile - South Helena Project Area.

Effects Common to All Alternatives

Wildland fire behavior in treated as well as untreated areas depends on the fuels in addition to topography and weather. Given the current condition the dynamics associated with lodgepole pine mortality, untreated areas can be expected to realize higher intensity fires that consume a considerable portion of duff and litter due to current density, stand structure, red needled litter, and stand composition (Agee and Skinner 2005; Graham et al. 2004). At this time there will certainly be the potential for a surface fire of adequate intensity to kill any residual live Douglas-fir, lodgepole pine, or ponderosa pine due to fireline intensity and the resultant heat pulse to the cambium (Kauffman et al. 2008).

Within the project area fuel will continue to accumulate as discussed in the no action alternative. Standing dead is beginning to fall and will continue to add to the current fuel loading.

Recent observations during wildfires in “gray stage” lodgepole pine in Canada indicate that previous assumptions regarding potential fire behavior in lodgepole pine may have been underestimated. Gray stage lodgepole pine indicates that time frame when the red needles have dropped from the trees. During the G4-0151 Fire in British Columbia during June of 2010, gray stage lodgepole produced many firebrands that started spot fires if they landed in a receptive fuelbed (Canada Fires 2010). The receptive fuelbed in this case were adjacent salvage harvests; the more residual slash and fine woody debris that remained on-site, apparently the more receptive the fuelbed to ignition (Canada Fires 2010). Spotting was observed over ½ mile in front of the main fire and rates of spread of 30 chains/hr. (0.4 miles/hr.) to 70 chains/hr. (about 0.9 miles/hr.) (Canada Fires 2010).

For stands that have succumbed to bark beetles, the dead trees which will have mostly fallen within fifteen years (Mitchell and Preisler 1998) will greatly heighten 1000-hr fuel loading. Heavy loadings of 1000-hr fuels allow for long residence time should a fire occur. Long residence time promotes smoldering of duff and litter which creates high smoke emissions and exposes mineral soil. Exposed mineral soil creates a suitable site

¹⁷ Percentiles are constructed by ranking data from smallest to largest and dividing the data into 100 equal parts. At the 97th percentile only 3% of the data have higher values. The 97th percentile condition for weather represents the near worst case scenario, high temperature and wind with low relative humidity. Live and dead fuel moistures under the 97th percentile condition are very low.

for noxious weed establishment and potential for erosion. Fire suppression costs can be high during extended mop-up phase to extinguish large dead logs.

There are important implications of MPB-induced tree mortality on firefighter safety and suppression tactics, including, safety zone size, escape route designation and escape time, and overall suppression strategy that have significant consequences for wildland fire personnel (Page et al., 2013a). The increase in large fallen dead wood (often called “jackstraw”) hampers fire suppression as these areas are difficult to walk through and chainsaws are needed to remove layers of logs in order to dig fireline (Figure 51). In the event of a wildfire, fire management staff would limit and/or restrict ground crews due to safety concerns related to snags and inadequate escape routes to safety zones as a result of the continuous surface fuel buildup (Red Mountain Flume Chessman Reservoir Project, Nunn Declaration 2014). Fireline production can be very slow which may limit the success of initial attack. Ignition potential is low; however, if a fire becomes established flame lengths and fireline intensity are such that resistance to control is very high, preventing hand crews and in many cases dozers from suppressing wildfires directly. Resiliency in this case is hampered as multiple large scale disturbances such as wildfire can remove future seed sources.



Figure 51. Example of downed wood (surface fuel) in Lodgepole stand killed by MPB and overhead snag hazard to public and forest workers.

Large portions of the project area have experienced MPB outbreaks and are in various stages of “forest unraveling¹⁸” which pose safety concerns to firefighters. Within the project area, standing dead trees exist that are vertically weak and susceptible to falling. Trees in that experienced an earlier onset of the MPB outbreak have already fallen resulting in layers of dead wood (jack-straw). Either of these scenarios creates challenging and unsafe conditions for firefighters to work in. For instance in areas with weak standing dead conditions, fire crews cannot safely engage fires because the frail standing trees can easily fall during suppression activities causing harm to firefighters. Under these conditions these trees have to be mitigated which increases necessary time for suppression and greatly increases the risk firefighters must take to suppress a fire. In situation where jackstraw exists, direct attack becomes unmanageable because more often

¹⁸ Forest unraveling is the condition where standing dead trees fall to the surface leading to changes in forest structure and surface fuel loadings. The rate at which the forest unravels is variable and is tied to time since beetle attack, weather factors such as windthrow, and other site specific conditions.

than not, getting ground suppression resources to the scene of a wildfire can take much longer to access as firefighters have to saw their way in through thick heavy downfall. In other areas, both of these conditions exist posing an even greater risk to firefighter safety because of the time it would take to saw through jackstraw and the amount of time exposed to overhanging standing dead trees that have the potential to fall on firefighters.

In a recent study done on exposure to snags and firefighting in a one acre wildfire initial attack scenario it was estimated that in Douglas Fir saw teams would experience 23.5 hours of exposure, in lodgepole pine saw teams would experience 16.3 hours of exposure, and in Ponderosa Pine saw teams would experience 9.5 hours of exposure to mitigate hazard trees. This study assumed two saw teams, mitigating hazard trees within a one acre fire area, this is just the time to make it safe to suppress the fire, not the time it would take to scout the fire, construct fireline, and mop-up the fire. It also doesn't allow for the time necessary to access the fire, establish safety zones, and mitigate hazards to either of those. Also, Initial Attack resources are typically one to two engines, and often the most qualified sawyers are also the necessary overhead for management of the fire. Since saw teams cannot perform falling operations at night it could take up to two days just to make the fire safe to begin containment operations, during which the fire would continue to grow and create more hazard trees and the need for more exposure and time to mitigate them (Kurtz 2015).

These conditions will continue in untreated areas across the project area.

Effects Common to All Action Alternatives

Action Alternatives

The action alternatives use similar types of vegetation treatments to meet the purpose and need for action. Acres and number of units by treatment type are displayed below.

Table 56. Comparison of vegetation treatment acreages and number of units for alternatives 2 and 3

Vegetation Treatment	Alternative 2		Alternative 3	
	Acres	Number of Units	Acres	Number of Units
Improvement Harvest	2,483	49	1,382	23
Clearcut with Leave Trees	3,573	41	2,348	19
Seed Tree with Leave Trees	298	3	0	0
Shelterwood with Leave Trees	363	4	102	2
Shaded Fuel Break	1,415	10	1,282	8
Low Severity Grassland Prescribed Fire	0	0	1,662	9
Low Severity Prescribed Fire	11,900	118	7,952	96
Mixed Severity Prescribed Fire	1,714	10	656	4
Private Land Buffers	2,090	45	2,283	46
Precommercial Thin	471	18	445	16
Total	24,308 acres	298 units	18,112 acres	223 units

There are two differences within the specific actions proposed by the two action alternatives: (1) alternative 2 does not have acres of ‘Low Severity Grassland Prescribed Fire’ and (2) alternative 3 does not have acres of ‘Seed Tree with Leave Trees’. Additionally, the two action alternatives differ by: (1) acres treated by treatment type; (2) location of treatment units; (3) specific treatment actions in Inventoried Roadless Areas; (4) the number of units; and (5) treatment intensities within the units. Even with these differences, both action alternatives were design to meet the purpose and need for the project. The general prescription of each treatment type is described in Table 57 below.

Table 57. General prescriptions of each specific action proposed by the action alternatives

	Treatment Type	Specific Action	General Prescription
Commercial Treatments	Improvement Harvest	Improvement Cutting followed by jackpot or underburn	Thin from below and remove overstory trees (i.e., “crown thinning”) in order to reduce density from an average of 100-140 to 50-80 basal area, which would reduce crown fire potential. Substantial amounts of green, healthy large diameter trees would be retained in these dry or mixed forests. In some areas there currently are not enough green trees remaining to meet residual basal areas. Retain Forest Plan required snags.
	Regeneration Harvest	Clearcut with reserve trees followed by site prep burn	Cut dead and dying lodgepole pine. Retain all other live conifers when they occur; primarily Douglas-fir with spruce and subalpine fir. These units would naturally regenerate with lodgepole pine. Retain Forest Plan required snags.
		Seed tree with reserve trees followed by site prep burn	Cut dead and dying lodgepole pine. Retain 10-20 trees per acre of well-distributed healthy Douglas-fir and ponderosa pine to provide seed. Natural regeneration would be promoted, though ponderosa may be planted. Retain Forest Plan required snags.
		Shelterwood with reserve trees followed by site prep burn	A mix of dead lodgepole and other species would be cut. Retain about 20-50 trees per acre of healthy Douglas-fir to provide seed and shelter for seedlings. Natural regeneration would be promoted, though ponderosa may be planted. Retain Forest Plan required snags.
Prescribed Fire	Shaded Fuel Break	Pile burn, jackpot burn or underburn	A mix of dead trees and understory trees would be hand or mechanically cut to increase canopy spacing and to alter the fuel profile, creating a shaded fuel break of the live, larger trees available within the unit. Thin from below (i.e., “crown thinning”) in order to reduce density from an average of 100-140 to 50-80 basal area. Slash created would be handpiled and burned or jackpot burned where feasible to reduce surface fuel loadings. Shaded fuel breaks would vary in width depending on topography, aspect and slope, stand composition, and expected fire behavior adjacent to the fuel break.
	Low Severity Grassland Prescribed Fire	Jackpot or pile burn	Low intensity grassland prescribed burning would be used to improve grassland and grass-shrub areas. In these areas, encroaching conifers would be reduced. Mechanical and hand rearrangement of fuels would occur, with smaller diameter (less than 12 inch) trees strategically slashed or thinned, slash created from these treatments would be handpiled and burned or jackpot burned. No active ignition would occur in the open grasslands or adjacent timber stands, fire may spread into these areas exhibiting low intensity burn characteristics.
	Low Severity Prescribed Fire	Jackpot burn or underburn	Low intensity prescribed burning would be used to improve dry forests and grass-shrub areas. In forest areas, savannah conditions would be created with understory ladder fuels and crown fire potential reduced by the treatments. In non-forest areas, encroaching conifers would be reduced. Mechanical and hand rearrangement of fuels would occur, with smaller diameter (less than 12 inch) trees strategically slashed or thinned to facilitate prescribed burning.
	Mixed Severity Prescribed Fire	Broadcast burn	This larger scale “Landscape Ecosystem Burn” is a mosaic of prescribed fire types and intensities resulting in a strategic landscape mosaic of fire effects – about 40-60 percent of each unit would be burned. Mechanical rearrangement of fuels would be used in some areas to contain aerial ignition zones – which are principally dead lodgepole stands. These units are adjacent to strategic buffers comprised of shaded fuel breaks or low severity prescribed fire burns. The treatments are within roadless areas.
Non-Commercial Treatments	Private Land Buffers	Pile burn or jackpot burn	Reduce hazardous fuels on NFS Lands creating a buffer zone near private land that has structures. Develop opportunities for citizens who have completed fuels reduction or defensible space treatment on their property to extend treatments onto public lands where it meets land management objectives. Treatment includes a wide range of hand and mechanical activities to rearrange and remove hazardous fuels and reduce crown fire potential by thinning trees. Buffers in the South Helena Portion would extend up to 100 yards from private boundaries onto FS lands. Buffers in the Tenmile Portion would extend up to 200 yards from private boundaries onto FS lands.

	Treatment Type	Specific Action	General Prescription
	Precommercial Thin	Precommercial thin followed by pile and burn	Small diameter trees in past harvest units would be cut leaving about 100 - 200 trees per acre of the best-formed trees; this would enhance growth and vigor and reduce the long-term risk of mountain pine beetle caused mortality. The limbs and tops of the fallen trees may be lopped and scattered to speed decomposition. Hand or machine piling and burning of piles would be completed where the fuel loading is an unacceptable risk.

Proposed Treatments

Fuel treatments will alter fire behavior in treated areas, thereby reducing the future effects of a potential wildfire (Omi and Martinson 2004; Reinhardt et al. 2008; Stratton 2004). Changes in suppression strategy resulting from fuel treatments, include: safer areas for firefighters, anchors for fireline construction, and areas from which to initiate burnout operations; or, fuel treatments which modified fire behavior to the extent that the need for suppression action was minimal (USDA Forest Service 2010b). Treatment unit locations are spatially arranged to provide opportunities to decrease the amount of area where indirect attack is required. This will allow firefighters to use treated areas to “box in” and suppress unwanted fires quicker, safer and keep fires smaller. Utilizing indirect suppression tactics will still be necessary under action alternatives; however, the area needed for indirect suppression would be reduced as more opportunities for direct suppression would exist by using treated units.

This does not account for on-the-ground firefighter safety concerns related to snags and inadequate escape routes to safety zones as a result of the continuous surface fuel buildup in areas where treatments do not occur. There are 37,087 acres under alternative-2 and 43,283 acres under alternative-3 which would not receive treatments and forested areas will remain a safety hazard to forest workers and the public. Reducing current and expected fuel loadings within treatment units will result in modifying the existing fuel profile enhancing fire suppression capabilities as well as forest worker and public safety in the area.

The proposed treatments will break-up contiguous natural fuel as stated in the Forest Plan as a forest-wide standard. In the event of a wildfire, these treatment areas are places where firefighters can more safely and effectively perform suppression actions and where aerial fire retardant will reach the burning surface fuels without interception from overstory vegetation (USDA Forest Service 2010b). Treatments are effective for about ten years as related to potential fire behavior (Finney et al. 2006; Omi et al. 2007) and a rate of twenty percent treatment per decade has been found most effective (Finney et al. 2006).

For units that will only have prescribed fire as a treatment, it is assumed that primary mortality as a result of burning in addition to secondary mortality caused by drought, insects, disease, or other causes will add woody debris over time as these snags fall in addition to the current coarse woody debris accumulations. This may result in the need to perform additional treatments to achieve low surface fuel loading; post-fire monitoring will need to be performed to determine this need as discussed in design criteria.

The need for maintenance treatments would be determined through resource future monitoring. If Monitoring identifies the need for maintenance treatment additional analysis would be completed.

All treatments utilizing management-ignited fire require the development of a prescribed fire plan that must follow all Federal, State, and local laws and regulations. These plans would be developed during implementation and will reflect how prescribe burning activities comply with regulations.

Post mechanical and hand slashing treatments would see a short term increase to rate of spread and flame length due to the recruitment of twigs, branch wood, needles and increase in herbaceous fuels prior to final treatment of prescribed fire. Implementation coordination with local fire management will take place prior to implementation to limit fire risk to any given area.

Alternative 1 (No Action)

Under alternative 1, no fuel treatment would occur. In the absence of disturbance, fuel conditions would generally persist or fuel loadings would increase throughout the project area. The overall result would likely be increased fire hazard.

The no action alternative is likely to result in fires that are more resistant to control, pose a greater risk to firefighters and the public, and potentially cause higher severity in the analysis area than the action alternatives. It is possible that the lack of treatment could place residents, adjacent landowners and Helena National Forest visitors exposed to increased fire intensity and risk should a wildfire occur. The largest threat of stand-replacing fires is to private property, homes, public safety, and firefighter safety throughout the landscape. In addition, the likelihood of a high-intensity wildfire starting in the affected areas on NFS / BLM lands and then spreading into non-NFS / BLM lands would be highest under this alternative.

Direct/Indirect Effects

As Forest conditions described in the Forested Vegetation report, the no action alternative provides the resource specialist a means for evaluating the current ecosystem conditions as a baseline. Under this alternative, current management plans would continue to guide management of the project area. New actions proposed with the Tenmile – South Helena project would not occur. Reducing intensity of wildfires and increasing fire suppression effectiveness for surrounding communities and key municipal watershed infrastructure would not take place. The specific actions proposed in the action alternatives to achieve the purpose and need for the project would not occur; these actions include no implementation of prescribed fire, treating 20-40 percent of the Tenmile Municipal Watershed, and minimizing firefighter exposure. Because these actions would not occur, the fuel loading on the forest floor would continue to increase as dead trees, as a result of the mountain pine beetle epidemic, would continue to fall. The existing and increasing difficulties with fire suppression associated with the current forest vegetation and fuel structure would remain, especially when compared to the actions proposed in alternatives 2 and 3. The direct, indirect, and cumulative effects of no action would be an increase in large dead wood (jackstraw) hampering fire suppression as these areas are difficult to walk through and chainsaws are needed to remove layers of logs in order to dig fireline.

Fireline production can be very slow which may limit the success of initial attack. The use of mechanical equipment during fire suppression could have potential negative impacts on other forest resources, and could be limited if fire behavior increased. Wildfire response resources would be limited to aviation due to the safety concerns related to utilizing ground personnel in areas of high mortality. In addition, heavy loadings of 1000-hr fuels allows for long residence time should a fire exposed mineral soil creates a suitable site for noxious weed establishment and potential for erosion.

The current distribution of FBFMs, continuity of fuels, and resistance to control and hazardous conditions for firefighters would continue in the short term. Conditions would continue to develop as described for untreated areas in Effects Common to All Alternatives. Resulting stand structures would be more conducive to crown fire due to increased ladder fuels. The sustained homogeneity of age and size class and the extent of high amounts of downed woody fuels may result in higher severity fire effects. Fire behavior within the project area would be expected to remain similar to the existing condition assuming no further disturbances occur.

The no-action alternative would not alter the fuel profile to modify fire behavior and would not meet the purpose and need of this project to improve conditions for public and firefighter safety in the event of a wildfire and to maintain consistent quantity and quality of water within the municipal watershed.

In the absence of human-caused or natural disturbance such as vegetation treatment activities and wildfire, there would be an increased accumulation of surface and ladder fuels due to the significant insect and disease activity, blow down of dead trees and the progression of forest succession. In the event of a wildfire, this accumulation of fuels would lead to an increase in fire behavior, increasing the risk to public and firefighter safety. Under these conditions, fire suppression capabilities would be limited due to safety concerns related to snags and inadequate escape routes to safety zones as a result of the continuous surface fuel buildup. In order to minimize firefighter exposure to the inherent hazards, on-the-ground firefighting would be generally limited to roadways, open forest canopies, and snag free zones. Machinery may also be utilized for fire suppression, heavy equipment, such as dozers, could have potential negative impacts on other forest resources, and could be limited under high intensity fire situations. This reduced suppression capabilities could lead to more acres burned and increased risk to other resources and the communities in the surrounding area.

Irreversible and Irretrievable Commitments

Changes in vegetation structure, composition, and horizontal continuity may result in undesirable consequences should a fire occur. The abundance and extent of downed fuels may result in high severity surface fire effects in the event of a wildfire. These fire effects could slow vegetation recovery following fire, result in erosion or sediment delivery to streams if duff and litter layers are consumed, or result in loss of certain vegetation types due to lack of a seed source. If such a fire occurs between the time seed from serotinous cone germination and the trees again produce cones, there could be an irreversible loss of seed source and thereby long term loss of conifer cover in some areas (Milburn 2013). This would be a greater loss under the no action alternative when compared to the two action alternatives because of the lack of acres treated.

Cumulative Effects

Timber harvest is occurring on private, city and federal lands and utility corridors in the project area. These activities will break up the fuel connectivity on a small scale. Regeneration harvests function as effective fuel reduction areas. Even in areas where an intermediate harvest occurs, the crown connectivity has been altered enough to affect the sustainability of crown fire within these stands. Depending on treatment type, size and time since treatment, harvest can make an area more defensible for fire suppression activities, modify fire behavior and increase safety of the public and firefighters.

Fuels treatments utilizing prescribed fire are occurring throughout the project area. These treatments are focused on fuels reduction in and around values at risk including WUI and Chessman Reservoir-Red Mountain Flume. In forest areas, savannah conditions would have been created with understory ladder fuels and crown fire potential reduced by these treatments. In non-forest areas, encroaching conifers would have been reduced.

Firewood cutting has an annual effect on forests 200 feet adjacent to open roads. Lodgepole pine and Douglas-fir are the preferred species. This activity has the potential to reduce coarse down woody material, snags, and fuel up to 200 feet from roads. Firewood cutting coupled with Roadside Hazard Tree Project (USDA HNF 2010) will maintain effective ingress and egress routes for landowners, recreationists, firefighters, and other Forest Service personnel by removing hazard trees instead of allowing these trees to fall over time. In areas of heavy firewood collection, the removal of dead wood breaks up horizontal and vertical fuel continuity; this action combined with the fuel-free road surface modifies fire behavior and improves firefighter safety and increases opportunities for fire suppression.

Grazing is occurring on active allotments in the project area except for the South Helena area. This has a minimal effect on fire and fuels. The only effects would be a reduction in fine fuels (grasses) for fire spread within that seasonal period.

Management of unplanned ignitions (wildfires) cannot be predicted; unplanned ignitions within the project area would be managed according to direction in the Forest Plan, Helena Fire Management Plan, and applicable laws and policies. Fire suppression will continue within the project area based on Forest Plan. Effect of suppression creates long lasting impacts on vegetation structure and process. With the exception of small fires that were suppressed, the homogeneity of this landscape has been largely unbroken. Forest structure and composition will continue to be altered with the lack of fire disturbance; the disruption of the natural fire intervals will contribute to higher stand densities, multi-layered stands and ladder fuels, and a greater homogeneity of structures across the landscape which result in a greater probability for disturbances to affect large contiguous areas (Hessburg et al. 2005).

Reasonably Foreseeable:

Nothing known of at this time for fuels resource

Conclusions

The No Action alternative would not meet the purpose and need of the project. This alternative would not be consistent with Helena Land and Resource Management Plan direction of:

- Providing a quantity and quality of water H1, H2 management areas
- Use rapid and aggressive fire control methods in H1, H2, and T4 management areas
- Maintain or improve vegetative conditions and livestock forage production L1 management area
- Maintain or improve range vegetative conditions and forage production for livestock and elk L2 management area
- Provide for maintenance and/or enhancement of fishery, big game, and nongame habitat, grazing allotments, visual quality, and water quality. R1 management area
- Provide healthy timber stands and optimize timber growing potential over planning horizon. T1 management area
- Maintain and/or enhance habitat characteristics favored by elk and other big game species. T3 management area
- Maintain healthy stands of timber within the visual quality objective of retention and partial retention T4 management area
- Optimize wildlife habitat potential, including old growth, over the long term W1 management area
- Maintain and/or enhance habitat characteristics favored by elk and other big game species during spring, summer, and fall W2 management area

Additionally no-action would not be consistent with the BLM Butte Field Office Resource Management Plan direction of:

- **FM1**-Provide an appropriate management response to all wildland fire, emphasizing firefighter and public safety.
- **FM2**-Move towards restoring and maintaining desired ecological conditions consistent with appropriate fire regimes.
- **FW1**-Restore and/or maintain the health and productivity of public forests, to provide a balance of forest and woodland resource benefits, as well as wildlife and watershed needs to present and future generations.
- **FW2**-Manage forestry resources to provide a sustained flow of local social and economic benefits and protect non-market economic values.
- **FW3**-Maintain and/or improve sustainability and diversity of woodland communities to meet ecological site potential.
- **FW4**-Manage dry forest types to contain healthy, relatively open stands with reproducing site-appropriate, desired vegetation species

No-action would be unresponsive to the Tri-County Wildfire Protection Plan by not following the goals of:

- Develop a strategic plan that looks across jurisdictional boundaries. Propose and implement projects that will protect communities at risk from wildfire. Develop and propose protection measures for municipal watersheds. Take measures to insure that escape routes are made defensible for the public and public safety workers.
- Encourage the federal and state agencies to continue creating fire defensible space around homes that border agency land if the home-owner has done work on their own land
- Focus first on the wildland urban interface communities at risk
- Attempt to stabilize the municipal watersheds of Helena and East Helena
- Use state of the art fire modeling methods to determine the best places to spatially locate dispersed fuels treatments in the general forested areas outside of the wildland urban interface area. Propose to treat a minimum of approximately 20 percent of the general forested area. (Spatial Strategies for Landscape Fuel Treatments, Mark A. Finney).
- Mitigating the wildland fire hazard.

This alternative would not respond to the National Cohesive Wildland Fire Management Strategy (2014) goals of;

- Restore and Maintain Landscapes - Landscapes across all jurisdictions are resilient to fire-related disturbances in accordance with management objectives
- Fire Adapted Communities - Human populations and infrastructure can withstand a wildfire without loss of life and property
- Wildfire Response – All jurisdictions participate in making and implementing safe, effective, efficient risk-based wildfire management decisions

Flame lengths and fireline intensity would continue to be high and likely to increase over time. As a result, the potential severity and extent of future wildland fires in the project area would worsen. Public and firefighter safety and threat to property in the wildland urban interface would not be minimized due to not removing standing dead or heavy loading of dead down.

Alternative 2 (Proposed Action)

The proposed treatments include using a combination of commercial harvesting, pre-commercial thinning and prescribed fire. Prescribed burning appears to be the most effective treatment for reducing a fire's rate of spread, fireline intensity, flame length, and heat per unit of area. Not only are surface fuels reduced by this treatment, but understory and ladder fuels are also reduced to the point where spotting and crowning are not a serious threat. Removing a portion of the canopy has the obvious effect of reducing the chance of a crown fire with or without surface fuel treatment. A management scheme that includes a combination of fuel treatments in combination with other land-management scenarios is critical for successfully reducing the size and intensity of wildfires (Van Wagtenonk 1996).

In all of the units it will be important following each treatment to complete the reduction of fuels on the ground whether excess natural fuels or post treatment activity fuels. In all

the units, woody debris either left on site from the treatment activity or existing fuels will be treated. Fuel treatments will be piling and burning or underburning or a combination to reduce fuels > 3 inch diameter to be within the range of 5 to 15 tons per acre. Excess ground fuels must be removed from the treatment areas to attain full effectiveness of reducing fire behavior. Weeds that contribute to or create hazardous fuels may be treated using herbicide within the project area under the 2007 Record of Decision for the HNF Noxious Weed Treatment EIS. This will assist in meeting the objective of modifying fire behavior to enhance firefighter and public safety, and reduction in probability of a widespread wildfire with high-severity watershed effects.

Previous studies on fuel treatment efficacy use Rothermel's surface fire model and Van Wagner's crown fire model to determine fuel treatments effects on potential fire behavior (Stevens 1998; Scott 1998; Fule' et al. 2001; Brose and Wade 2002). These studies have shown that thinning treatments can reduce crown fire hazard by reducing ladder and canopy fuels, and treatments are most effective if the residual stand includes larger, more fire resistant trees (thinning from below) (Graham et al. 1999; Brown et al. 2004; Stephens and Moghaddas 2005) and if activity fuels are subsequently removed (Alexander and Yancik 1977; Stephens 1998). Applying fuel reduction treatments simultaneously to multiple fuels strata is the most effective approach to reducing fire severity (Raymond and Peterson, 2005).

Table 58 displays the difference between flame length and fireline intensity when comparing the existing condition (alternative 1) to post-treatment results for activities proposed in alternative 2.

Table 58. Fire Behavior Indicators by Treatment Type for Existing Condition and alternative 2

Treatment Type	Existing Condition Flame Length Maximum (feet)	Alternative 2 Post-Treatment Flame Length Maximum (feet)	Alternative 2 Post-Treatment Percent Reduction in Flame Length	Existing Condition Fireline Intensity (btu/ft/s)	Alternative 2 Post Treatment Fireline Intensity (btu/ft/s)	Alternative 2 Post Treatment Percent Reduction in Fireline Intensity
Improvement Harvest	7.2	2.9	59.7%	494.0	120.1	75.7%
Clearcut with Leave Trees	13.1	4.3	67.2%	925.4	175.1	81.1%
Seed Tree with Leave Trees	34.1	5.9	82.7%	2964.8	322.1	89.1%
Shelterwood with Leave Trees	8.3	5.4	34.9%	562.6	247.4	56.0%
Shaded Fuel Break	4.5	1.9	57.8%	228.2	39.0	82.9%
Low Severity Prescribed Fire	6.2	2.6	58.1%	391.5	79.5	79.7%
Mixed Severity Prescribed Fire	5.9	1.6	72.9%	341.2	17.9	94.8%
Private Land Buffers	11.2	3.8	66.1%	886.6	253.9	71.4%
Precommercial Thin	15.1	3.3	78.1%	1208.6	156.4	87.1%

Direct Effects – Minimize Firefighter and Forest Worker Exposure

Reducing the risk to firefighters is analyzed based on treated acres that remove overhead hazards, accumulated downfall, and reduce predicted fire behavior encountered during fire suppression efforts. All treatments, except precommercial thinning, will reduce overhead hazards, accumulated downfall and reduce predicted fire behavior on 23,873 acres under Alternative 2. Effects of reducing these hazards include;

- Increased opportunity for ground firefighters to perform direct suppression strategies and tactics
- Increased safety for firefighters due to reduced overhead hazards, large quantities of down material and decreased fire intensity
- Increased efficiency in suppression tactics

Table 59. Treatment acres equating to firefighter exposure reduction

Treatment Type	Acres
Improvement Harvest	2,483
Clearcut with Leave Trees	3,573
Seed Tree with Leave Trees	298
Shelterwood with Leave Trees	363
Shaded Fuel Break	1,415
Low Severity Prescribed Fire	11,900
Mixed Severity Prescribed Fire	1,714
Private Land Buffers	2,090
Total	23,873

Direct Effects – Treat 20-40 Percent of the Tenmile Watershed

Treatment units were strategically designed in the Tenmile Watershed within the project boundary to reduce fire spread. Only the portion of the watershed within the project boundary was considered for this. 38,674 acres of Tenmile Watershed are within the project boundary, 14,622 acres are planned for treatment. This is 38% of the watershed. Strategically treating 20 to 40 percent of the watershed will result in the following effects:

- Restoring heterogeneity of vegetation structure to the landscape
- Provide increased opportunities for direct attack fire suppression
- Increased mosaic of vegetation structure, age, and density
- Restore fire to the landscape

Table 60. Acres treated in the watershed

Treatment Type	Acres
Improvement Harvest	665
Low Severity Prescribed Fire	6,551
Mixed Severity Prescribed Fire	1,714
Precommercial Thin	225
Private Land Buffers	1,562
Regeneration Harvest	2,880
Shaded Fuel Break	1,025
Grand Total	14,622

Direct Effects – Feasibility

Units were analyzed for feasibility based on hand or mechanical treatments. In this alternative 8,482 acres are planned for hand treatments, with no mechanical entry, the remainder of the units are planned for mechanical. Criteria for feasibility are based on safety and treatment effectiveness. Many of these units cannot be treated due safety concerns related to stand conditions as a result of tree mortality, the exposure to hand crews is to an unacceptable risk. Utilizing mechanical methods is necessary to effectively mitigate safety concerns associated with implementation treatments on 15,821

acres and to remove and or modify the amount of fuels present within units. Effects of utilizing mechanical methods include:

- Removal of standing and down dead material prior to prescribed burning resulting in lower intensity fire.
- Safer environment for the public, forest workers.

Direct Effects – Fire Behavior

Flame Length

Fuel reduction treatments are designed to remove existing hazardous fuels that have accumulated either on the forest floor, ladder fuels, or in the crowns. The treatments proposed are designed to reduce flame length which has several effects:

- Lowering flame lengths decreases the likelihood that there would be crown fire initiation.
- Lowering flame lengths increases the ability to actively suppress fires effectively during a severe fire season. Using hand crews is the most effective way to attack wildfires; hand crews are generally not effective with flame lengths over 4 feet in height. The activities proposed in Alternative 2 effectively reduce the flame lengths in treatment units, so hand crews can be utilized in most cases.
- In addition to reducing flame lengths, the proposed treatments also increase the likelihood that future fire starts would be successfully attacked at other features, i.e., roads, which fuel treatments, are often adjacent too, in the event that a fire burns into a treated area from a non-treated area.

Table 61. Flame length comparison between Existing Condition and Alternative 2

Treatment Type	Existing Condition Flame Length Maximum (feet)	Alternative 2 Post-Treatment Flame Length Maximum (feet)	Alternative 2 Post-Treatment Percent Reduction in Flame Length
Improvement Harvest	7.2	2.9	59.7%
Clearcut with Leave Trees	13.1	4.3	67.2%
Seed Tree with Leave Trees	34.1	5.9	82.7%
Shelterwood with Leave Trees	8.3	5.4	34.9%
Shaded Fuel Break	4.5	1.9	57.8%
Low Severity Prescribed Fire	6.2	2.6	58.1%
Mixed Severity Prescribed Fire	5.9	1.6	72.9%
Private Land Buffers	11.2	3.8	66.1%
Precommercial Thin	15.1	3.3	78.1%

Fireline Intensity

Altering fuels in treatment units are designed to modify fire intensity. A consequence of changing vegetation structure is the potential of changing rates of spread. Van Wagtendonk (1996) found rates of spread increase slightly from prescribed burning alone showing the lowest surface rates of spread compared to biomass removal followed by burning having the next lowest surface rates of spread in treated units. Units that had no follow-up burning after biomass treatment showed higher surface rates of spread and higher fireline intensity compared to treatments that included burning. Fireline intensity is a function of rate of spread and heat per unit area (Behave 2009). The overall effect of changing the vegetation structure and its effects on rates of spread and heat per unit area are captured within fireline intensity. Proposed treatments are designed to reduce fireline intensity providing the following effects:

- Reduced fire intensity to vegetation and firefighting personnel.
- Provide increased opportunities for direct attack suppression strategies and tactics.
- Increased rates of spread combined with reduced flame length result in an overall reduction in fireline intensity.

Table 62. Fireline Intensity comparison between Existing Condition and Alternative 2

Treatment Type	Existing Condition Fireline Intensity (btu/ft/s)	Alternative 2 Post Treatment Fireline Intensity (btu/ft/s)	Alternative 2 Post Treatment Percent Reduction in Fireline Intensity
Improvement Harvest	494.0	120.1	75.7%
Clearcut with Leave Trees	925.4	175.1	81.1%
Seed Tree with Leave Trees	2964.8	322.1	89.1%
Shelterwood with Leave Trees	562.6	247.4	56.0%
Shaded Fuel Break	228.2	39.0	82.9%
Low Severity Prescribed Fire	391.5	79.5	79.7%
Mixed Severity Prescribed Fire	341.2	17.9	94.8%
Private Land Buffers	886.6	253.9	71.4%
Precommercial Thin	1208.6	156.4	87.1%

Indirect Effects

For units that have prescribed fire only as a treatment, it is assumed that primary mortality as a result of burning in addition to secondary mortality caused by drought, insects, disease, or other causes will add woody debris over time as these snags fall. These areas may require additional treatments in order to reach desired conditions. Follow-up treatment would be determined through monitoring.

Irreversible and Irretrievable Commitments

Some mortality of live trees will likely occur as a result of broadcast burning. This fire caused mortality would eventually add to future fuel loadings. Temporary closure of

trails and forest lands to public use during implementation will result in the temporary loss of recreation opportunities. These are the same for both action alternatives.

Cumulative Effects

The cumulative effects analysis includes past, current, and reasonably foreseeable future activities as these activities influence the fire/fuels resource. Most activities have little influence on fire/fuels, with the exception of harvest, thinning, prescribed fire, wildfire, and livestock and wildlife grazing that change the vegetation. Management of wildfires cannot be predicted; wildfires within the project area would be managed according to direction in the Forest Plan, Helena Fire Management Plan, Butte Field Office RMP, and applicable laws and policies. See Appendix C of this report for detailed cumulative effects analysis.

Alternatives 2 and 3 cumulative effects from past, current, and reasonably foreseeable activities are discussed in the No Action Alternative above. Cumulative effects resulting from activities proposed in alternative 2 would further reduce fuel loadings within proposed treatment units on 23,873 acres, under alternative 3 fuel loadings would be reduced on 17,667 acres. These changes would modify fire behavior, increasing safety for the public and firefighters as described in this report and Minimize detrimental fire effects to municipal watershed.

Alternative 3

Similar to the proposed action, the proposed treatments include using a combination of commercial harvesting, pre-commercial thinning and prescribed fire. Site preparation burning is also proposed and would take place after harvesting is complete to prepare areas for tree planting. Alternative 3 was developed based on resource issues that were identified internally and externally through scoping and preliminary analysis. These concerns included wildlife use areas, elk security and hiding cover areas, and avoiding use of mechanized equipment in IRAs.

Table 63 displays the difference between flame length and fireline intensity when comparing the existing condition (alternative 1) to post-treatment results for activities proposed in alternative 3.

Table 63. Fire Behavior Indicators by Treatment Type for Existing Condition and Alternative 3

Treatment Type	Existing Condition Flame Length Maximum (FEET)	Alternative 3 Post-Treatment Flame Length Maximum (FEET)	Alternative 3 Post-Treatment Percent Reduction in Flame Length	Existing Condition Fireline Intensity (BTU/FT/S)	Alternative 3 Post Treatment Fireline Intensity (BTU/FT/S)	Alternative 3 Post-Treatment Percent Reduction in Fireline Intensity
Improvement Harvest	7.3	3.4	53.4%	501.5	153.0	69.5%
Clearcut with Leave Trees	21.4	4.7	78.0%	1892.8	225.2	88.1%
Shelterwood with Leave Trees	16.7	4.6	72.5%	1333.4	194.7	85.4%

Treatment Type	Existing Condition Flame Length Maximum (FEET)	Alternative 3 Post-Treatment Flame Length Maximum (FEET)	Alternative 3 Post-Treatment Percent Reduction in Flame Length	Existing Condition Fireline Intensity (BTU/FT/S)	Alternative 3 Post-Treatment Fireline Intensity (BTU/FT/S)	Alternative 3 Post-Treatment Percent Reduction in Fireline Intensity
Shaded Fuel Break	4.0	2.2	45.0%	187.4	63.4	66.2%
Low Severity Grassland Prescribed Fire	4.4	3.3	25.0%	194.8	110.3	43.4%
Low Severity Prescribed Fire	6.6	2.6	60.6%	447.4	90.1	79.9%
Mixed Severity Prescribed Fire	3.0	1.7	43.3%	118.6	20.6	82.6%
Private Land Buffers	10.9	3.7	66.1%	851.3	245.0	71.2%
Precommercial Thin	15.8	3.7	76.6%	1275.2	203.5	84.0%

Direct Effects – Minimize firefighter exposure

Reducing the risk to firefighters is analyzed based on treated acres that remove overhead hazards, accumulated downfall, and reduce predicted fire behavior encountered during fire suppression efforts. All treatments, except precommercial thinning, will reduce overhead hazards, accumulated downfall and reduce predicted fire behavior on 17,663 acres under alternative 3. Effects of reducing these hazards include;

- Increased opportunity for ground firefighters to perform direct suppression strategies and tactics
- Increased safety for firefighters due to reduced overhead hazards, large quantities of down material and decreased fire intensity
- Increased efficiency in suppression tactics

Table 64. Treatment acres equating to firefighter exposure reduction

Treatment Type	Acres
Improvement Harvest	1,382
Clearcut with Leave Trees	2,348
Shelterwood with Leave Trees	102
Shaded Fuel Break	1,282
Low Severity Grassland Prescribed Fire	1,662
Low Severity Prescribed Fire	7,952
Mixed Severity Prescribed Fire	656
Private Land Buffers	2,283
Total	17,667

Direct Effects – Treat 20-40% of the Tenmile Watershed

Treatment units were strategically designed in the Tenmile Watershed within the project boundary to reduce fire spread. Only the portion of the watershed within the project boundary was considered for this. 38,674 acres of Tenmile Watershed are within the project boundary, 11,090 acres are planned for treatment. This is 29 percent of the watershed. Strategically treating 20 to 40 percent of the watershed will result in the following effects:

- Restoring heterogeneity of vegetation structure to the landscape
- Provide increased opportunities for direct attack fire suppression
- Increased mosaic of vegetation structure, age, and density
- Restore fire to the landscape

Table 65. Acres treated in the watershed

Treatment Type	Acres
Improvement Harvest	169
Low Severity Grassland Prescribed Fire	1,206
Low Severity Prescribed Fire	3,831
Mixed Severity Prescribed Fire	656
Precommercial Thin	214
Private Land Buffers	1,601
Regeneration Harvest	2,354
Shaded Fuel Break	1,059
Grand Total	11,090

Direct Effects – Feasibility and Effectiveness

Units were analyzed for feasibility based on hand or mechanical treatments. In this alternative 8,558 acres are planned for hand treatments, with no mechanical entry, the remainder of the units are planned for mechanical. Criteria for feasibility are based on safety and treatment effectiveness. Many of these units cannot be treated due safety concerns related to stand conditions as a result of tree mortality, the exposure to hand

crews is to an unacceptable risk. Utilizing mechanical methods is necessary to effectively mitigate safety concerns associated with implementation treatments on 9,549 acres and to remove and or modify the amount of fuels present within units. Effects of utilizing mechanical methods include:

- Removal of standing and down dead material prior to prescribed burning resulting in lower intensity fire.
- Safer environment for the public, forest workers

Direct Effects – Fire Behavior

Flame Length

Fuel reduction treatments are designed to remove existing hazardous fuels that have accumulated either on the forest floor, ladder fuels, or in the crowns. The treatments proposed are designed to reduce flame length which has several effects:

- Lowering flame lengths decreases the likelihood that there would be crown fire initiation.
- Lowering flame lengths increases the ability to actively suppress fires effectively during a severe fire season. Using hand crews is the most effective way to attack wildfires; hand crews are generally not effective with flame lengths over 4 feet in height. The activities proposed in Alternative 3 effectively reduce the flame lengths in treatment units, so hand crews can be utilized in most cases.
- In addition to reducing flame lengths, the proposed treatments also increase the likelihood that future fire starts would be successfully attacked at other features, i.e., roads, which fuel treatments, are often adjacent too, in the event that a fire burns into a treated area from a non-treated area.

Table 66. Flame length comparison between Existing Condition and alternative 3

Treatment Type	Existing Condition Flame Length Maximum (FEET)	Alternative 3 Post- Treatment Flame Length Maximum (FEET)	Alternative 3Post- Treatment Percent Reduction in Flame Length
ImprovementHarvest	7.3	3.4	53.4%
Clearcut with Leave Trees	21.4	4.7	78.0%
Shelterwood with Leave Trees	16.7	4.6	72.5%
Shaded Fuel Break	4.0	2.2	45.0%
Low Severity Grassland Prescribed Fire	4.4	3.3	25.0%
Low Severity Prescribed Fire	6.6	2.6	60.6%
Mixed Severity Prescribed Fire	3.0	1.7	43.3%
Private Land Buffers	10.9	3.7	66.1%
Precommercial Thin	15.8	3.7	76.6%

Fireline Intensity

Altering fuels in treatment units are designed to modify fire intensity. A consequence of changing vegetation structure is the potential of changing rates of spread. Van Wagendonk (1996) found rates of spread increase slightly from prescribed burning alone showing the lowest surface rates of spread compared to biomass removal followed by burning having the next lowest surface rates of spread in treated units. Units that had no follow-up burning after biomass treatment showed higher surface rates of spread and higher fireline intensity compared to treatments that included burning. Fireline intensity is a function of rate of spread and heat per unit area (Behave 2009). The overall effect of changing the vegetation structure and its effects on rates of spread and heat per unit area are captured within fireline intensity. Proposed treatments are designed to reduce fireline intensity providing the following effects:

- Reduced fire intensity to vegetation and firefighting personnel.
- Provide increased opportunities for direct attack suppression strategies and tactics.
- Increased rates of spread combined with reduced flame length result in an overall reduction in fireline intensity.

Table 67. Fireline Intensity comparison between Existing Condition and alternative 3

Treatment Type	Existing Condition Fireline Intensity (BTU/FT/S)	Alternative 3 Post Treatment Fireline Intensity (BTU/FT/S)	Alternative 3 Post Treatment Percent Reduction in Fireline Intensity
Improvement Harvest	501.5	153.0	69.5%
Clearcut with Leave Trees	1892.8	225.2	88.1%
Shelterwood with Leave Trees	1333.4	194.7	85.4%
Shaded Fuel Break	187.4	63.4	66.2%
Low Severity Grassland Prescribed Fire	194.8	110.3	43.4%
Low Severity Prescribed Fire	447.4	90.1	79.9%
Mixed Severity Prescribed Fire	118.6	20.6	82.6%
Private Land Buffers	851.3	245.0	71.2%
Precommercial Thin	1275.2	203.5	84.0%

Primary difference between this alternative and alternative 2 is removal of mechanized treatments in IRAs, units were dropped due to feasibility to implement without the use of equipment, other units were designed and added to compensate for units that were dropped.

Indirect Effects

For units that will only have prescribed fire as a treatment, it is assumed that primary mortality as a result of burning in addition to secondary mortality caused by drought, insects, disease, or other causes will add woody debris over time as these snags fall in addition to the current coarse woody debris accumulations.

Cumulative Effects

The cumulative effects analysis includes past, current, and reasonably foreseeable future activities as these activities influence the fire/fuels resource. Most activities have little influence on fire/fuels, with the exception of harvest, thinning, prescribed fire, wildfire, and livestock and wildlife grazing that change the vegetation. Management of wildfires cannot be predicted; wildfires within the project area would be managed according to direction in the Forest Plan, Helena Fire Management Plan, Butte Field Office RMP, and applicable laws and policies. See Appendix C of this report for detailed cumulative effects analysis.

Conclusions

Alternative 1 (no action alternative) does not address the purpose and need of the project. Alternative 1 would leave the forest stands in the project area in a state that a wildfire occurring would likely exhibit fire behavior that is difficult to control during times of moderate to high fire danger. Additionally, due to mortality fuel loads will continue to increase resulting in higher intensity fire.

Both alternative 2 and 3 would meet the purpose and need of this project. Fire behavior modeling indicates that in both action alternatives, fuels reduction treatments reduce flame length and fireline intensity. The firefighting environment would be improved due to reductions in resistance to control, reduced overhead hazards and reduction of large diameter dead down fuel. This is indicated by reductions in flame length and fireline intensity post treatment. Due to these reductions in fire intensity, our ability to initial attack and control fires would be improved. Specifically, intermediate harvest, regeneration harvest, pre-commercial thinning followed by under burning and prescribed fire treatments would contribute to the need for firefighter and public safety. This should allow firefighters to better protect human and natural resource values due to reduced fire behavior intensity and resistance to control. Additionally, as a result of reduced fire behavior future fires in treated areas would burn with lower intensity resulting in fewer negative impacts to overstory vegetation and soils. Both action alternatives reintroduce fire to the landscape which will benefit and favor fire-tolerant species. The level of treatment differs between action alternatives. Alternative 2 proposes approximately 24,308 of treatment acres that would lead to safer and healthier conditions as alternative 3 proposes approximately 18,112 acres.

The differences in effectiveness are related to the number of acres treated in each alternative and the location of treatment areas. The importance or priority for treatment of any individual unit is based not only on predicted changes in fire behavior by treatments as displayed previously, but also a number of other factors. One of these factors would be the location of a unit. The location of a fire start on any given day within the project area cannot be predicted. However, units that are generally closer to values at risk are often more important for treatment than those farther away. There are some exceptions to this such as a unit adjacent to other treated areas that could be used as a firebreak, thus hopefully stopping a fire before it gets closer to values. Alternative 2 is the most effective in meeting the goals of the purpose and need due to the highest number of acres treated, treatment methods and location of treatment units. Alternative 1 - no action alternative would be least effective since no acres would be treated.

Forest Plan Consistency

Forest Plan standards and guidelines would be met with both action alternatives. The results of this project to fire/fuels meet Forest Plan standards as prescribed fire utilized for resource maintenance and enhancement is an accepted vegetation treatment in all indicated management areas (USDA HNF 1986). Treatment units would break-up contiguous natural fuel as stated in the Forest Plan as a forest-wide standard.

Air Quality

Introduction

Air quality is managed through federal, state, and local laws and regulations designed to assure compliance with the Clean Air Act ((42 U.S.C. 7401-7671q)). The Environmental Protection Agency (EPA) has the primary role of establishing ambient air quality standards and ensuring compliance to those standards through the Clean Air Act. In Montana, air quality is managed at three levels of government: federal (Environmental Protection Agency [EPA]), state (Montana Department of Environmental Quality [MTDEQ]), and local health departments (county rules). The state agency that has federal delegation of authority for meeting the Clean Air Act requirements is the MTDEQ Air Quality Program.

The below analysis describes the effected environment and potential effects to air quality resulting from proposed activities on both the Butte Field Office (BFO) of the Bureau of Land Management (BLM) and Forest Service lands as part of the Tenmile – South Helena project.

The Helena National Forest (HNF) Land and Resource Management Plan (Forest Plan) (USDA 1986) states that the Forest will comply with federal and state standards and will protect air quality. The HLCNF is currently in compliance with all national and state ambient air quality standards.

The Butte Field Office (BFO) of the Bureau of Land Management (BLM) Resource Management Plan (RMP) (2009) goals for air quality are to ensure BLM authorizations and management activities protect the local quality of life and sustain economic benefits by complying with tribal, local, state, and federal air quality regulations, requirements and implementation plans.

Implementation of any of the action alternatives would be in compliance with Forest Plan standards and BLM RMP goals to comply with air quality standards by using Best Available Control Technology (BACT) techniques as defined in the Administrative Rules of Montana for Open Burning (ARM 17.8.601), and by not causing or contributing to any exceedances or violations of Federal or State ambient air quality standards.

Under the no action alternative (alternative 1), no treatments would occur, and there would be no anthropogenic emissions (emissions from planned burning) contributing to air quality degradation. However, this alternative would increase accumulation of ground fuel, leading to the increased possibility of high intensity wildfires in the future that would have a high potential for air quality degradation due to smoke. Wildland fire emissions contribute to air pollution by increasing the atmospheric levels of pollutants that are detrimental to human health and ecosystems and degrade visibility, leading to hazardous or general nuisance conditions. (Urbanski et al, 2009)

The air quality impacts for alternatives 2 and 3 can be divided into two phases. The first phase would involve the use of mechanized equipment for the purpose of implementing treatment activities. The second phase would be the implementation of prescribed fire activities (broadcast, underburn, jackpot, and pile burns). Direct and indirect effects of

the two action alternatives include air pollution emissions from the use of logging machinery and equipment, fugitive dust (dust released from the mechanical disturbance of granular substances exposed to air) released by vehicular traffic and logging equipment, and smoke from burning activities (PM_{2.5} emissions).

The quantifiable air quality measurement indicator is PM_{2.5} emissions, primary and secondary standards for PM_{2.5} emissions are 35 µg/m³ (Units of measure are micrograms per cubic meter of air (µg/m³)). Both alternatives 2 and 3 would have the same type of modeled fuel treatments; jackpot, underburn, broadcast, site prep, and pile burn. Although alternative 2 would include more acres of prescribed burning, only a certain number of acres could be burned per day under either alternative. Therefore, the daily PM_{2.5} emissions of each alternative would be equal. In alternative 1, with increased ground fuels accumulations, the PM_{2.5} emissions would likely be greater than for either alternative 2 or 3 if a wildfire occurred.

In alternatives 2 and 3 projected 24-hour PM_{2.5} emissions are below the primary and secondary standard of 35 µg/m³. Predicted PM_{2.5} emissions are 15.030 µg/m³ at all distances greater than 1.0 mile from the burns for the prescribed burning conducted in the spring and fall. Projected 24-hour PM_{2.5} emissions are below 14.14 µg/m³ at all distances greater than 1.0 mile for the pile burns, which would occur in winter. These PM_{2.5} concentration estimates include both emissions generated from prescribed burning and background emissions. Within those minimum ambient distances of 1.0 mile, the public would either be restricted from entering area and/or warned about high smoke concentrations through multiple avenues such as news releases, signs, and personal contacts. Cumulative effects from implementing alternative 2 or alternative 3 are expected to be minimal or non-existent if design criteria are followed.

Assumptions

Design Elements

All model runs were conducted using the following vegetation types: Society of American Foresters Forest cover type (SAF) SAF 210 Interior Douglas-fir, and SAF 218 Lodgepole Pine. For Wildfire analysis (alternative 1 – no action), it was assumed a natural wildfire would burn 170 acres per day and the meteorological values and mixing heights used resulted in an excellent ventilation index (MacDonald Pass Fire 2009). Additional runs for alternatives 2 and 3 were conducted using slash fuel loading conditions for the prescription burns and pile burns. Prescribed fire was modeled at 200 acres per day for a baseline prediction, utilizing the same vegetation types as alternative 1 and heavy slash fuel model for all types of treatments. The piles were modeled as semi-spheres, 40 feet wide by 20 feet high by 80 feet in length and a 20% packing ratio, 40 piles per day. An average 1.0 mile distance to receptors was used for all analyses.

Section 190 of the Clean Air Act requires the EPA to issue technical guidance on Reasonably Available Control Measures (RACMs) and Best Available Control Measures (BACMs) for prescribed fires. RACMs and BACMs will be used as mitigation measures. Some examples of the mitigation measures include annual plans, emission inventory systems, implementation of emission reduction techniques, monitoring, surveillance and enforcement programs, local and state regulatory oversight, and public

education/awareness programs. BACMs are required measures for nonattainment areas. Design elements to be used for the Tennmile - South Helena Project would include:

- Prior to initiating any burning activities, a burn plan in compliance with the Montana/Idaho Airshed Group Operating Guide would be prepared for areas proposed within alternatives 2 and 3.
- Location, timing and possible smoke effects would be disclosed in the local newspaper and to local residents prior to burning.
- During the burn implementation periods, the prescribed burn boss would be responsible for monitoring site specific smoke analysis with current weather and air quality conditions prior to ignition. Using that information, the burn boss would determine how many acres can be burned and identify any effects on residents located downwind of the project burn area.
- Coordination of prescribed fire activities in other project areas would take place to ensure the amount of smoke would be manageable if multiple units across the project areas were burned.

Information Used

Current Air Quality Emissions in Project Area

The Tennmile - South Helena Project is located in Lewis and Clark, Jefferson, and Powell Counties of Montana; however, the nearest air quality monitoring site is the Rossiter Pump House site, located at 1497 Sierra Road East, in Helena, Lewis and Clark County. According to Brandon McGuire of the MTDEQ Air Quality Program, the PM_{2.5} concentration varies throughout the year, with the highest numbers in the winter months. Mr. McGuire advised using data from the Rossiter site. He recommended breaking the data into three groups to show the seasonal variations in PM_{2.5} concentrations site.

Table 68 shows the averaged PM_{2.5} concentrations from the Rossiter Pump House monitoring site.

Table 68. Averaged Daily PM_{2.5} Emissions from Rossiter Pump House Monitoring Site

	November, December, January, February (2012-2014)	March, April, May, June (2012-2014)	July, August, September, October (2012-2014)
Average PM _{2.5} Concentration (µg/m ³)	10.2	5.0	8.8

Lewis and Clark County is identified as an attainment area for state and federal standards regarding CO, Pb, NO₂, SO₂, PM₁₀, and PM_{2.5}. Therefore, this project is exempt from conformity determination (the requirement that federal activities be shown to help communities attain federal air quality standards). The nearest nonattainment areas are Butte, which is located 47 miles to the south-southwest (nonattainment for PM₁₀) and East Helena, which is located 6 miles to the northeast (nonattainment for SO₂ and Pb).

Class I Wilderness Areas

The nearest mandatory Class I Wilderness Areas are the Gates of the Mountain Wilderness, located approximately 23 air miles northeast, the Anaconda-Pintlar Wilderness, located approximately 48 air miles southwest, and the Bob Marshall Wilderness Complex, located approximately 47 air miles northwest of the Tennmile - South Helena Project.

An IMPROVE (Interagency Monitoring of Protected Visual Environment) site managed by the Forest Service is located in the Gates of the Mountain Wilderness. The collected samples from the IMPROVE site are analyzed for PM₁₀, PM_{2.5}, SO₄, NO₃, organic carbon, elemental carbon, dust, and soot. This data helps identify sources that generate pollutants for visibility degradation.

According to The Spatial and Seasonal Patterns and Temporal Variability of Haze and its Constituents in the United States: Report V (IMPROVE 2011), the Gates of the Mountain IMPROVE Site showed positive trends in summer concentrations from 2000 to 2008 (Hand 2011). The Gates of the Mountains Wilderness site PM_{2.5} data (2012 to 2014) was obtained from Brandon McGuire of MTDEQ. That data was averaged for the same months as for the MTDEQ data, for comparison purposes and is included in Table 69.

Table 69. Daily PM_{2.5} Emissions Gates of the Mountains IMPROVE Monitoring Site

	November, December, January, February (2012-2014)	March, April, May, June (2012-2014)	July, August, September, October (2012-2014)
Average PM _{2.5} Concentration (µg/m ³)	0.6	1.7	5.4

The data from the Gates of the Mountains Wilderness area shows the PM_{2.5} emissions are highest in the summer months, when smoke inducing activities, such as wildfires, are occurring and lowest in the winter months when smoke inducing activities would be the lowest.

Methodology and Scientific Accuracy

Analysis of smoke production was conducted using current versions of FOFEM 5.9.2 (First Order Fire Effects Model), CONSUME 2.1, and SIS (Smoke Impact Spreadsheet Version V V11-30-2004) smoke production models. The use of each model is recommended through guidance specific to Region 1 Forests (Story, 2005) and encouraged by state open burning regulations defining Best Available Control Techniques for prescribed wildland open burning in ARM 17.8.601(1)(a)(iii).

Air Quality, Affected Environment

Introduction

This section describes the Tennmile - South Helena Project affected environment in terms of air quality using data from the Rossiter Pump House Monitoring site and the IMPROVE Monitoring site in the Gates of the Wilderness. This analysis describes the potential effects to air quality resulting from proposed activities on both the Butte Field

Office (BFO) of the Bureau of Land Management (BLM) and Forest Service lands as part of the Tenmile – South Helena project.

Analysis Area

The analysis area for the Tenmile - South Helena Project includes Airshed 6 (project area) and Airshed 5 which is directly adjacent to the western boundary of the project area. Downwind airsheds within 100 kilometers (62 miles) that could be impacted, including any sensitive areas and mandatory Class I Airshed areas are also included in the analysis. The sensitive areas are defined as population centers, non-attainment areas, schools, hospitals, highways and airports. Within the project area the community of Rimini and the community of Unionville are potential downwind receptors. The nearest downwind sensitive areas adjacent to the project area are the community of Helena, located approximately a half mile northeast, Highway 12 East, located approximately 1.5 miles north, the community of Clancy, located 3 miles to the southeast, the community of Montana City, located 4 miles to the east, and the community of Elliston, located approximately 7 miles northwest of the project area. The nearest mandatory Class I Wilderness Area is the Gates of the Mountain Wilderness, located approximately 15 air miles northeast of the Tenmile - South Helena Project.

Current Air Quality Estimates

The HLCNF and the Butte Field Office managed lands are currently in compliance with all national ambient air quality standards. The air quality in the project area is good to moderate (98+% of the days in 2014), according to the EPA's Air Quality Index (AQI) Report (EPA 2014a). There are no major heavy industrial areas in the HLCNF. Existing sources of emissions in the Tenmile - South Helena Project area include vehicles, road dust, residential wood burning, wood fires, burning of logging slash, and burning for fuel reduction.

There are no Major sources within 25k of the project area that produce more than 100 tons per year of emissions (25k and 100 tons per year are guidance from R1 Smoke Guidance Document for stationary sources that should be disclosed). Other sources (less than 100 tons per year or greater than 25k distance from project area) of emissions within 100 air kilometers of the project area are the cities of Helena and East Helena, Continental Lime Plant in Townsend, Montana Tunnel Mines in Jefferson City, Ash Grove Cement in Montana City, Holcim US Inc. Cement Plant in Trident, Sun Mountain Lumber in Deer Lodge, and the Golden Sunlight Mine in Whitehall, (list is not all inclusive), with vehicle exhaust, residential wood burning smoke, road and agriculture dust, and construction equipment as the primary emitters (Grenon and Story 2009). These emissions from these sources visibly do not impact the project area due to dispersal by predominant winds from the west with very strong wind gradients. Regional wildfire smoke has accumulated within the area during periods of extensive wildfire activity in 1988, 1994, 2000, 2003, 2007, and 2012. The prime source of wildfire emissions is from central and southern Idaho, southwest Montana, and the Bob Marshall Wilderness. Other than wildfire smoke, no additional sources of air quality degradation are expected.

No specific monitoring information is available concerning existing air quality within the Tenmile - South Helena Project area. The nearest particulate data is from the Rossiter

Pump House air quality station, which is located approximately 18 miles northeast of the project area, in Helena, Montana.

Air Quality, Environmental Consequences

Effects Common to All Alternatives

There are potential impacts to air quality from prescribed fire occurrences under all alternatives.

Effects Common to All Action Alternatives

The air quality impacts for alternatives 2 and 3 can be divided into two phases. The first phase would involve the use of mechanized equipment for the purpose of implementing treatment activities. The second phase would be the implementation of prescribed fire activities (broadcast, underburn, jackpot, and pile burns).

Alternative 1 – No Action

Direct and Indirect Effects

Under this alternative, no treatments would occur, and there would be no anthropogenic emission contribution to degrade air quality. This alternative could, however, increase accumulation of ground fuel causing an increased possibility of high intensity wildfires in the future. This could result in a higher potential for air quality degradation. Wildfires are known to result in high levels of emissions, including greenhouse gases and associated NAAQS violations.

Air quality can be degraded by smoke from wildfires to the point of human illness in some instances. Smoke from wildfire could also cause visual impacts to the surrounding areas and create hazardous driving conditions on adjacent state, county, and Forest Service roads for extended periods of time. Should a stand-replacing wildfire occur, dust emissions, resulting from fire suppression equipment (both on and off roads) could show a marked increase until seasonal rains soak the surface of the burned area.

Air emissions from wildfires burning under the no action alternative (alternative 1) were modeled and Table 70 and Table 71, below, show the PM_{2.5} emissions in pounds per acre (lbs/acre) and concentrations in µg/m³ for an estimated 170 acres burned per day wildfire (MacDonald Pass Fire 2009).

Table 70. Emissions from wildfire burning under alternative 1 – no action (pounds per acre)

PM₁₀	PM_{2.5}	NO_x	SO₂	CO	CO₂	CH₄
982	833	39	47	10755	65140	497

Table 71. PM_{2.5} Concentrations from wildfire burning under alternative 1 – no action (µg/m³)

Downwind Distance from Wildland Fire Scenario (miles)	24-Hour Average PM _{2.5} Concentrations (µg/m ³)
0.1 (Fireline)	185.26
0.5	93.17
1.0	36.826
2.0	24.161
3.0	20.889
4.0	18.969
5.0	17.359

The modeling results show the PM_{2.5} projected concentrations are 185.26µg/m³ on the fireline and 36.826µg/m³ 1 mile downwind of the fire.

Irreversible and Irretrievable Commitments

There are no irreversible or irretrievable commitments of air quality resources for this alternative.

Cumulative Effects

In an environment such as the Tennile - South Helena Project where air mixing and dispersal is robust, past impacts to air quality are not usually evident or cumulative. The HLCNF and BFO of the BLM are currently in compliance with all national ambient air quality standards. The only effect of alternative 1 on air quality would be the increased likelihood of a high severity wildfire, which could have a short-term effect on air quality, such as localized visibility impacts. If such an event were to take place, the addition of these emissions to existing anthropogenic emissions could break the 35µg/m³ threshold for PM_{2.5} 24 hour concentrations.

Alternatives 2 and 3

Direct and Indirect Effects

Alternatives 2 and 3 have the same type of modeled fuel treatments; jackpot, underburn, broadcast, site prep, and pile burn Site Prep burning, burning following harvest where the bulk of the canopy was removed. The goal is to reduce logging slash and prepare the site for regeneration. Underburn, or the use of fire to only burn the understory layer beneath the canopy layer, would be used in the precommercial thinning areas. Broadcast burning, a controlled burn where the fire is intentionally ignited and allowed to burn over a designated area would be used in portions of the regeneration harvest and slashing areas of the project. Jackpot burning, which involves igniting the fuels collected from the silvicultural treatments, would be used in the intermediate harvest and some of the regeneration harvest areas. Pile burn, hand or mechanical piling of fuels, generally follows slashing or harvest where slash disposal is needed but broadcast burning is not feasible or desirable.

Smoke impact modeling was conducted for alternatives 2 and 3 using slash fuel loading conditions for the prescription burns and pile burns. Using an average distance of 2 miles

acreage was modeled at 200 acres for spring and fall burns (broadcast, jackpot, underburn). For Pile Burning it was estimated there would be 40 pile burns per day, assuming thirty minute ignition-intervals. The piles were modeled as semi-spheres, 40 feet wide by 20 feet high by 80 feet in length and a 20 percent packing ratio. An average 1.0 mile distance to receptors was used for all analyses.

Table 72. Alternatives 2 and 3 prescribed burning concentrations of activity fuels: spring and fall ($\mu\text{g}/\text{m}^3$)

Tenmile - South Helena Project Smoke Model Results Broadcast, Underburn, and Jackpot Prescribed Burning for Spring Months (March to June)		Tenmile - South Helena Project Smoke Model Results Broadcast, Underburn, and Jackpot Prescribed Burning for Fall Months (July to October)	
Downwind Distance from Burn Unit (miles)	24-hour Average PM _{2.5} Concentrations ($\mu\text{g}/\text{m}^3$)	Downwind Distance from Burn Unit (miles)	24-hour Average PM _{2.5} Concentrations ($\mu\text{g}/\text{m}^3$)
0.1	39.573	0.1	40.593
0.2	35.512	0.2	35.313
0.3	32.467	0.3	31.965
0.4	29.071	0.4	28.857
0.5	25.315	0.5	25.226
0.6	21.726	0.6	21.472
1.0	15.03	1.0	14.277
2.0	10.119	2.0	9.516
3.0	8.404	3.0	7.86

For spring burning, projected 24-hour PM_{2.5} emissions are below 15.03 $\mu\text{g}/\text{m}^3$ (24-hour average PM_{2.5} 35 $\mu\text{g}/\text{m}^3$ standard) at all distances greater than 1.0 mile from the burn. For fall conditions, projected 24-hour PM_{2.5} emissions are below 14.277 $\mu\text{g}/\text{m}^3$ (24-hour average PM_{2.5} 35 $\mu\text{g}/\text{m}^3$ standard) at all distances greater than 1.0 mile from the burn. The distances from the communities of Rimini, Unionville, and the city of Helena which are within or directly adjacent to the project area could impact receptors with greater than PM_{2.5} 35 $\mu\text{g}/\text{m}^3$, which could put these areas in moderate to unhealthy for sensitive receptors categories. Within those minimum ambient distances the public would be restricted from the area and/or warned about elevated smoke concentrations through multiple avenues such as news releases, signs, and personal contacts and/or area access closures would be implemented.

Table 73. Model results for alternatives 2 and 3 pile burning concentrations ($\mu\text{g}/\text{m}^3$)

Downwind Distance from Burn Unit (miles)	24-hour Average $\text{PM}_{2.5}$ Concentrations ($\mu\text{g}/\text{m}^3$)
0.1	71.937
0.5	24.407
1.0	14.148

For the pile burns, projected 24-hour $\text{PM}_{2.5}$ emissions are below $14.148 \mu\text{g}/\text{m}^3$ (24-hour average $\text{PM}_{2.5}$ $35 \mu\text{g}/\text{m}^3$ standard) at all distances greater than 1.0 miles from the burn for the pile burns. Within those minimum ambient distances the public would be warned about elevated smoke concentrations through multiple avenues such as news releases, signs, and personal contacts and/or area access closures would be implemented. The burning would be completed over a 3–8 year period in the spring or fall for prescribed burns and winter for pile burns. Spring burns would likely occur during a period of more wind dispersion than fall due to longer spring daytime length and higher mixing heights. The smoke plumes would likely disperse in a generally easterly direction. $\text{PM}_{2.5}$ from burns would not be likely to impact surrounding communities. Some concentrations of smoke might occur near residences in the project area. This would most likely occur during the burn smoldering phase where smoke could be trapped by nighttime inversions.

Beyond the minimum ambient distances, the smoke concentrations are expected to be within NAAQS and state of Montana air quality standards. The Tenmile - South Helena Project burns would be coordinated with the Montana/Idaho State Airshed Group. The operations of the Montana/Idaho State Airshed Group are critical to minimize cumulative smoke/ $\text{PM}_{2.5}$ air quality impacts. The State Airshed Group Monitoring Unit in Missoula evaluates forecast meteorology and existing air quality statewide by individual airshed and specifies restrictions when smoke accumulation is probable due to inadequate dispersion.

During the burn implementation periods, the prescribed burn boss is responsible for conducting a site specific smoke analysis with current weather and air quality conditions prior to ignition. Using that information, the burn boss would determine how many acres can be burned and identify any effects on residents located downwind of the project burn area.

Irreversible and Irretrievable Commitments

There are no irreversible or irretrievable commitments of air quality resources for these alternatives.

Cumulative Effects

In areas with good air mixing and dispersal, air resources are somewhat unique in that the past impacts to air quality are not usually evident or cumulative. The Tenmile - South Helena Project emissions would be cumulative only with other concurrent local emission sources such as adjacent Forest Service Ranger Districts and/or other Forests prescribed burning on the same day, as well as burning for both agricultural and private forestation needs. There are very few sources of emissions within the immediate area, less than 2 air miles. However, when expanded to the maximum scope of the air quality analysis (up to

a 100 air kilometer radius), there exists a possibility that emissions from the cities of Helena, East Helena, Butte, Deerlodge, Anaconda, and Townsend, and Continental Lime Plant in Townsend, Montana Tunnel Mines in Jefferson City, and Ash Grove Cement in Clancy, (list is not all inclusive) vehicle exhaust, residential wood burning smoke, road and agriculture dust, and construction equipment may influence the overall air quality, thus limiting the ability to burn on a given day. Accumulation of smoke from controlled burning is limited through scientific monitoring of weather conditions and formal coordination of burns. Members submit a list of planned burns to the Smoke Management Unit (SMU) in Missoula, Montana. For each planned burn, information is provided describing the type of burn to be conducted, the number of acres, as well as the location and elevation at each site. Burns are reported by "Airshed" which are geographical areas with similar topography and weather patterns. The program coordinator and a meteorologist provide timely restriction messages for airsheds with planned burning. Weather balloons may be launched and tracked to identify specific atmospheric conditions to aid in decision-making. The SMU issues daily decisions which can restrict burning when atmospheric conditions are not conducive to good smoke dispersion. Restrictions may be recommended by airshed, elevation or by special impact zones around populated areas. The Smoke Management Unit posts daily burning restrictions by airshed on the MT/ID Airshed Group website. If an Airshed Group member receives a smoke complaint or otherwise becomes aware of potential or actual smoke intrusions, the member shall notify the appropriate Airshed Coordinator as soon as possible. Proper attention to smoke concerns is an inherent function of the coordination process. It may help prevent additional burn restrictions, penalties, or even litigation. However incomplete the information regarding the source of the offending smoke may be, to track smoke concerns is important and each member is encouraged to assist with coordinating smoke complaint information to better serve the public, the DEQ and the smoke management program (Montana/Idaho Airshed Group Operating Guide, 2010). A member's failure to follow all procedures or burn restrictions or approvals issued under the SMP may result in Letters of Warning, Notices of Violation, or fines from state DEQs, or ultimately, may be considered grounds for revocation of membership in the Montana/Idaho Airshed Group.

Historically, the Helena-Lewis & Clark National Forest Prescribed Fire program has complied with air quality standards by using Best Available Control Technology (BACT) techniques as defined in the Administrative Rules of Montana for Open Burning (ARM 17.8.601), and by not causing or contributing to any exceedances or violations of Federal or State ambient air quality standards (MT/ID Airshed Group Airshed Management System – www.smokemu.org).

Conclusions

The air quality standards are currently showing attainment for PM_{2.5} 24-hour standard in the in the project area according to the EPA's Air Quality Index Report (EPA 2014). The HLCNF and BFO of the BLM are in compliance with all national ambient air quality standards.

The effect of no action on air quality would be the increased risk of a high severity wildfire, which could have a significant effect on air quality, such as localized visibility

impacts and extended duration health hazards. When coupled with existing anthropogenic emissions, the possibility for above standard PM_{2.5} is probable. Implementation of alternatives, as demonstrated in the smoke modeling with incorporated design features, would be in compliance with the HNF Plan and BFO of the BLM RMP by complying with air quality standards by not causing or contributing to any exceedences or violations of Federal or state standards and by cooperating with the Montana Air Quality Bureau in the Prevention of Significant Deterioration (PSD) program and by using Best Available Control Technology (BACT) techniques as defined in the Administrative Rules of Montana for Open Burning (ARM 17.8.601). . Smoke concentrations are expected to be within NAAQS and state of Montana air quality standards. The Tenmile - South Helena Project prescribed burns would be coordinated with the Montana/Idaho State Airshed Group, and specific restrictions would be implemented when smoke accumulation is probable due to inadequate dispersion. By incorporating all previously described design features, the HNF Plan direction would be met under all action alternatives, both for Forest-wide Airshed overall and for the use of prescribed fire in all affected management areas.

Wildlife

Introduction

The Helena National Forest, in particular the Tenmile – South Helena project area, provides habitat for a variety of wildlife species that range from sensitive species (e.g. wolverines) to hunted species (e.g. elk), small mammals, birds, and amphibians.

Vegetation management – i.e. timber harvest and prescribed fire - can affect the way many animals use an area. In general, vegetation management improves and increases habitat for some species while reducing habitat for others. Disturbance associated with these activities can also affect an animal's use of a given area. The disturbance may be temporary or long term, depending on the severity of the disturbance and the species affected. Wildlife behavior may take the form of avoidance, habituation, or attraction.

This report describes the affected environment and environmental consequences of the three alternatives on species and habitats and includes:

Driving Issues: These involve wildlife species or habitat features that have had a primary role in shaping project alternatives, and they are therefore discussed in detail. Driving Issues are: elk, mule deer, Canada lynx, wetland/riparian areas, and cool moist forested habitat.

Other Prominent Issues: A number of species and habitat elements, while having less influence on project design, are consequential enough to invite detailed discussion similar to that provided for “driving issues”. These include the following: dry forested habitat, travel corridors and linkage zones, habitat fragmentation, dead tree habitats (snags and coarse woody debris), migratory landbirds and shorebirds, grizzly bear, wolverine, and 4 management indicator species (marten, goshawk, pileated woodpecker, hairy woodpecker).

Topics not Analyzed in Detail: This category includes species, habitats, and management components that contribute to an understanding of the local wildlife resource but that (1) by themselves have had little effect on project design, (2) are covered by detailed analysis of other species and habitat elements, or (3) are unlikely to meaningfully affect or be affected by any of the project alternatives. They are covered more briefly than the “driving” and “prominent” issues and the rationale for doing so is provided in that section. Some of them are addressed at length in background reports for other resources (Forest Vegetation, Range, Soils, Fire, and Weeds). Topics in this category include the following: aspen, whitebark pine, old-growth, edge and ecotone, grassland habitat, livestock grazing, noxious weeds, white-tailed deer, moose, black bear, mountain lion, and Forest Service and/or BLM sensitive species (gray wolf, boreal toad, fisher, black-backed woodpecker, Brewer’s sparrow, and spotted bat).

The no action alternative would have no immediate effect on wildlife habitat in the project area. However, the condition of these forests is now in rapid transition. Mature forest formations have declined due to the mountain pine beetle. Most of the remaining mature forest overstory is provided by Douglas-fir or other shade-tolerant species, which has been unaffected by the pine beetles. Some of the Douglas-fir is in relatively pure stands, some in stands mixed with now-dead lodgepole pine. The stands dominated by Douglas-fir are now the primary refuge for species needing mature interior forest as a habitat base.

In the future, given the dramatic erosion of mature lodgepole pine forest in the project area, wildlife associations dependent on these forests could also decline. Most species will be able to adapt to the new Douglas-fir dominated mature forests, but population abundances will inevitably decline because of the loss of suitable habitat. On the other hand, generalist species and those favored by open-grown forest, uncanopied habitats, and extensive accumulations of coarse woody debris could increase (e.g. olive-sided flycatchers).

The direct and indirect effects of the action alternatives on wildlife habitat vary depending upon the species in question. Alternative 2 has the greatest potential to modify habitat for those species associated with dead and dying trees. Woodpecker species attracted to the abundance of insects in the project area most likely will experience declines in foraging habitat as tree densities are reduced in an effort to reduce fuel loading. Other wildlife species that rely on large trees for nesting may benefit in the long term as large tree growth is promoted through mechanical and prescribed fire treatments.

Lynx and grizzly bears, both listed as threatened species by the U.S. Fish and Wildlife Service, are present in the project area. The action alternatives would result in changes to lynx habitat in the project area. In the short term there are increases in early stand initiation structural stage and denning habitat and reductions in stand initiation and multistoried hare habitat. In the mid to long term there are increases in stand initiation hare habitat. Many of the planned treatments are in lynx habitat in the stem exclusion structural stage or ‘other’ lynx habitat that do not provide snowshoe hare habitat. Implementation of either action alternative would result in a determination of ‘may affect

likely to adversely affect' lynx due to the loss of habitat and connectivity. There is no effect to Critical Habitat under either action alternative.

For grizzly bears, both action alternatives would improve landscape level foraging habitat, enhance whitebark pine, result in short term reductions in cover, and potentially increase the risk of bear/human interaction during project implementation. However, implementation of either action alternative 'may affect but is not likely to adversely affect' grizzly bears.

Several Forest Service and/or BLM sensitive species occur or have potential habitat in the project area. Wolverines have been detected in the project area as well as flammulated owls and black-backed woodpeckers among others. The action alternatives would have some effect on sensitive species either through disturbance associated with project activities or through habitat modification.

Elk are a driving issue primarily due to ongoing losses of habitat due to the mountain pine beetle and impacts associated with habitat reduction under the action alternatives. The action alternatives would result in the immediate removal of hiding and thermal cover, more so in Alternative 2. As a result of existing habitat conditions that are already below Forest Plan thresholds, implementation of either action alternative would require a site specific amendment for the following standards: Forest-wide standards 3, 4a, 4c, and components of standard 6 and Management Area standards for H-1, H-2, L-2, T-3, and W-1.

The Environmental Baseline

The "Affected Environment" section summarizes baseline information on wildlife habitats, wildlife populations, and environmental processes characteristic of the project area and the surrounding landscape. This provides a context for gauging the effects of environmental changes that can be expected under different action alternatives (alternatives 2 and 3). The affected environment is synonymous with the conditions that would prevail under the "no action" alternative (alternative 1). The "Environmental Consequences" section derives from the environmental baseline in its determination of effects associated with the three alternatives.

Because of the pervasive influence of the mountain pine beetle epidemic, which has coursed through Helena and Lewis & Clark National Forests (Forest) pine forests since 2006, forest conditions in the project area and throughout much of the surrounding landscape are atypical of what has been the norm over the past several decades, and they do not reflect what Forest planners envisioned when devising Forest Plan management goals for wildlife in the early 1980s [USDA 1986, p. II/11 – II/21]. Roughly forty percent of the forest stands in the project area are dominated by mature/pole lodgepole pine forests, the overstories of which are now mostly dead. As a consequence, overstory conditions, which have already become more open with the loss of foliage, are about to change even more dramatically over the next 5 to 10 years as dead trees fall.

In the following sections, the affected environment for wildlife is described primarily in terms of what is present on the ground today [which is similar to what has been present during the 3 years of wildlife fieldwork on which this report is based]. However, the

implications of the evolving forest structure for local wildlife associations over the next decade are considered as well.

Hierarchy of Issues

Following direction in the National Environmental Policy Act (NEPA), those wildlife issues with potential to be “truly significant to the action in question” are emphasized and while those of “other-than-significant issues” [40 CFR 1500, 1502] are abbreviated in their analysis. The following aspects of the wildlife resource are emphasized in this analysis (See Appendix A of the Wildlife Report, Wildlife Analysis Approach):

- Species, habitat features, and environmental processes that have some real potential to be measurably impacted by timber harvest, thinning, and prescribed fire at the scale proposed under the two action alternatives;
- Species or habitat components that might be affected to an extent that designated thresholds (standards, guidelines) are approached or crossed under any of the alternatives;
- Species whose normal routines might be seriously disrupted by human activity during project implementation on a scale that could disrupt local populations;
- Focal habitat features, the functioning of which might be impaired by environmental conditions arising from any of the alternatives;
- Selected issues that, for one reason or another, have proven controversial in the public arena over the past few years.

Using these criteria, the analysis is divided into the following hierarchy:

Driving Issues: These involve wildlife species or habitat features that have had a primary role in shaping project alternatives, and they are therefore discussed in detail. Driving Issues are: elk, mule deer, Canada lynx, wetland/riparian areas, and cool moist forested habitat.

Other Prominent Issues: A number of species and habitat elements, while having less influence on project design, are consequential enough to invite detailed discussion similar to that provided for “driving issues”. These include the following: dry forested habitat, travel corridors and linkage zones, habitat fragmentation, dead tree habitats (snags and coarse woody debris), migratory landbirds and shorebirds, grizzly bear, wolverine, and 4 management indicator species (marten, goshawk, pileated woodpecker, hairy woodpecker).

Topics not Analyzed in Detail: This category includes species, habitats, and management components that contribute to an understanding of the local wildlife resource but that (1) by themselves have had little effect on project design, (2) are covered by detailed analysis of other species and habitat elements, or (3) are unlikely to meaningfully affect or be affected by any of the project alternatives. They are covered more briefly than the “driving” and “prominent” issues and the rationale for doing so is provided in that section. Some of them are addressed at length in background reports for other resources (Forest Vegetation, Range, Soils, Fire, Weeds). Topics in this category include the following: aspen, whitebark pine, old-growth, edge and ecotone, grassland habitat,

livestock grazing, noxious weeds, white-tailed deer, moose, black bear, mountain lion, and FS and/or BLM sensitive species (gray wolf, boreal toad, fisher, black-backed woodpecker, Brewer's sparrow, and spotted bat).

Non-Issues: Analyses of some species and habitats that are sometimes analyzed in Helena NF NEPA documents are not included here because (1) they are not present or only fleetingly present in the project area, (2) they have been covered by previous coarse-filter analysis or analysis of management indicator species, or (3) their populations would not be meaningfully affected by the project. These include the following: mountain goats, pronghorn antelope, a number of species and habitat components that are particularly widespread and abundant (deer mice, ground squirrels, mountain chickadees, pinegrass, huckleberries, etc.), and several sensitive species (bighorn sheep, harlequin duck, northern bog lemming, leopard frog, plains spadefoot, peregrine falcon, bald eagle). These topics are addressed only in passing.

Topic Organization

This report is organized according to the hierarchy of issues described above rather than on the more traditional organization scheme of habitat and species groups. As a result, “threatened and endangered species”, “sensitive species”, “big game species”, “management indicator species”, and “wildlife habitats”, which normally serve to group species and habitat components, are not all-inclusive here. Rather the species and habitats are dispersed among the issue categories— “driving issues”, “prominent issues”, and so on. This organization applies to both the “Affected Environment” and “Environmental Consequences” sections of this report.

Regulatory Framework

National Forest Management Act

The Forest Service is charged with maintaining the diversity of all existing native and desired non-native vertebrate species in a planning area under the National Forest Management Act (NFMA) of 1976. The regulations associated with NFMA require that the Forest Service establish habitat objectives for maintaining viability of management indicator species (MIS) throughout a planning area (typically, a National Forest). The Helena NF uses an MIS list and follows protocols and other management direction relating to species viability from the USFS (United States Forest Service) Northern Region (Region 1) office in Missoula.

Forest Service Manual

The Forest Service Manual (FSM) provides direction for the management of terrestrial resources. FSM 2630 provides overall objectives for maintaining and improving wildlife habitat. Section 2670 establishes objectives and procedures for managing and protecting threatened, endangered, and sensitive species.

Helena Forest Plan

The Helena Forest Plan (HFP: USDA 1986) provides standards and guidelines that set the framework for management of wildlife species. Forest-wide standards providing

direction for wildlife management are identified on pages II/17 – II/21 of the Plan. Additional guidance is provided by management recommendations from external documents incorporated into the Forest Plan at the outset (Montana Cooperative Elk-Logging Study 1985; Grizzly Bear Recovery Plan [USDI 1983]) or amended into the Plan in subsequent years (Off-Highway Vehicle [USDA and USDI 2001]); Northern Rockies Lynx Management Direction [USDA 2007B]). Several other amendments dealing with specific areas and resource issues have been added as well.

The Forest Plan also identifies 23 Management Areas (MAs), and provides direction for each. Management Areas are not large unified administrative units: rather, they have been delineated as a patchwork of irregular, often-small tracts of land, defined by topography and vegetation and spread across the landscape in the pattern of a jigsaw puzzle [see MA map for the Tenmile – South Helena project area (Project Record)]. MA direction relative to wildlife is summarized below for the 12 management areas that occur within the Tenmile – South Helena project area:

- **H-1** – This management area occupies a large contiguous block of multiple habitat formations in the upper Tenmile Creek watershed, accounting for roughly $\frac{3}{4}$ of Helena NF lands in the drainage. The overriding management goal is to preserve water quality and quantity in the City of Helena's municipal watershed. Management also maintains cover and forage for both game and non-game wildlife and provides dispersed recreation opportunities. This is the largest MA in the project area, covering nearly 23 percent of it.
- **H-2** – This is another management area dedicated to preserving water quality and quantity within the Helena municipal watershed. Goals for providing wildlife habitat and dispersed recreation opportunity are the same as in MA H-1. However, MA H-2 also allows for timber harvest that optimizes growing potential and protects soil and water resources. The MA occupies nearly 7 percent of the project area within the Tenmile drainage.
- **T-1** – Management goals emphasize timber production. Wildlife and fisheries habitat improvement projects may be implemented, as long as they are compatible with the management area goals. This MA occupies about 15 percent of the Tenmile – South Helena project area.
- **T-3** – Timber management needs to accommodate big game spring and summer use and may be used as a tool for wildlife habitat improvement. MA T-3 covers less than 1 percent of the project area.
- **T-4** – Timber management may go forward but needs to adhere to the requirements of sensitive viewing areas as well wildlife habitat. The MA occupies nearly 2 percent of the project area.
- **T-5** – Management goals allow for timber production within constraints set by other resources. Wildlife and fisheries habitat improvement projects may be implemented, provided they are compatible with the management area goals. Adequate thermal and hiding cover should be maintained adjacent to forage areas, provided timber harvest volumes are not significantly reduced over the rotation period. This MA covers nearly 9 percent of the area.

- **L-1** – Management goals emphasize livestock grazing. Specific wildlife and fisheries needs will be identified and considered when developing allotment management plans, provided the needs are compatible with area goals. Habitat improvement projects will be scheduled when they would help achieve area goals. This MA covers about 2 percent of the Tenmile – South Helena project area.
- **L-2** – These are predominantly non-forested big game winter range areas within grazing allotments, and management strategy is designed to balance the needs of wintering elk and deer with those of domestic livestock. Manipulation of livestock numbers, seasons of use, distribution, and rotation patterns combined with habitat improvement projects will be designed to maintain and improve vegetation condition for all grazers within the allotments. MA L-2 is situated in the northern, lower elevation reaches of the project area, occupying about 1 percent of it.
- **R-1** – These are primitive and semi-primitive lands, primarily at higher elevation, that are suitable for dispersed, non-motorized recreation. As such, they are also suitable as wildlife habitat for a variety of species but, in particular, for wildland species wary of human presence. MA R-1 lands cover 7 percent of the project area.
- **M-1** – These are lands where most active resource management is uneconomical or environmentally infeasible. Management practices to maintain or improve wildlife habitat will be permitted where necessary to meet the objectives of adjacent management areas. This accounts for roughly 12 percent of the area.
- **W-1** – Management goals emphasize optimizing wildlife habitat potential. Habitat improvement practices, including road management, prescribed fire, and other techniques, will be used to maintain and/or enhance the quality of big game and nongame habitat. In particular, adequate thermal and hiding cover should be maintained adjacent to forage areas. Generally, this means providing at least 25 percent cover, where available, on identified winter range. This MA covers about 2 percent of the project area.
- **W-2** – Management goals emphasize optimizing wildlife habitat potential in riparian and wetland areas and in other productive areas with high quality forage, cover, and other key habitat components. These are inevitably highly localized sites and they account for less than 0.5 percent of the project area.

Federal Land Policy Management Act (FLPMA)

FLPMA is the primary authority for BLM's management of public lands. This law provides the overarching policy by which public lands will be managed and establishes provisions for land use planning, land acquisition and disposition, administration, range management, rights-of-way, designated management areas, and the repeal of certain pre-FLPMA laws and statutes.

Bureau of Land Management (BLM) Manual

The BLM 6840 Manual Special Status Species Management provides direction for the management of sensitive species.

Butte Resource Management Plan Bureau of Land Management

The portions of the project area that fall within the BLM purview are governed by the Butte Resource Management Plan (USDI BLM 2009). Less than 2% of the project area occurs on BLM managed lands.

Endangered Species Act

Endangered Species Act (ESA) of 1973 requires all Federal agencies to review any project authorized, funded, or carried out to determine whether or not the action is likely to jeopardize the continued existence of species listed as threatened or endangered or species proposed for listing. In the Divide landscape, this requirement applies to 2 species listed as threatened (Canada lynx and grizzly bear). The review is accomplished via preparation of a biological assessment (BA) that looks at the potential impact of a proposed action (but not all of its alternatives) on listed or proposed species that may be present in or around the project area.

National Environmental Policy Act

The National Environmental Policy Act (NEPA) of 1969 requires that all environmental analyses consider a full range of reasonable alternatives to a proposed action. Reasonable alternatives are those that address the significant issues and meet the purpose and need for the proposed action. For the Tennmile – South Helena Vegetation Project, three alternatives that meet these criteria have been prepared and analyzed in an environmental impact statement (EIS).

Migratory Bird Memorandum of Understanding

In December 2008, the Forest Service and the U.S. Fish and Wildlife Service (USDI Fish and Wildlife Service [FWS]) signed a “Memorandum of Understanding” to promote the conservation of migratory birds (USDA and USDI FWS 2008). Section D (3) of the Memorandum obliges the Forest Service, within its NEPA process, to “evaluate the effects of agency action on migratory birds, focusing first on species of management concern along with their priority habitats and key risk factors”.

In April 2010, the BLM entered into a similar “Memorandum of Understanding” to promote the conservation of migratory birds (USDI BLM and USDI FWS 2010). Section F obliges the BLM within its NEPA process “to evaluate the effects of the BLM’s actions on migratory birds during the NEPA process, if any, and identify where take reasonably attributable to agency actions may have a measurable negative effect on migratory bird populations, focusing first on species of concern, priority habitats, and key risk factors”.

Assumptions

Underlying Environmental Trends

The current project is part of a response to a major shift in the environmental baseline on National Forest lands in the Tennmile drainage and the area southwest of Helena: namely, the widespread deterioration of mature forest canopy in pine stands attacked by mountain pine beetles. The pine beetle infestation has been Forest-wide, but the Tennmile – South Helena project area is of particular concern because of its role as a municipal watershed

and its location immediately southwest of Helena—the direction from which wildfire would approach the City.

Above-normal beetle activity was first noted in 2005, and by 2009, the outbreak had reached its peak (in terms of acres affected). As of 2014, beetle activity had largely faded back to endemic levels. It killed pine trees of all species—ponderosa, lodgepole, whitebark, and limber pine—but its effects have been most pervasive in lodgepole pine forests. In drainages dominated by lodgepole pine, more than 90 percent of the green forest canopy has often been eliminated across broad swaths of the upland slopes [Figure 52].

We assume that while the proposed project would further modify the wildlife environment across a substantial portion of the project area, these alterations would be of an appreciably lower magnitude than those that have been produced by the bark beetles. The primary change following the beetle outbreak will be the transformation of mature interior forest into open-canopied early seral forest across much of the landscape [Figure 55]. In beetle-impacted areas, the Tenmile – South Helena Project would produce numerous blocks of habitat with many fewer snags (in the short-run) and much less coarse woody debris (in the long-run). Implications for wildlife would vary among species and species groups: that is, there is no uniform trend—upward, downward, or stable—that can be discerned for the wildlife resource as a whole. But, general trends in habitat can be described, and they are summarized in the following section.

Implications of the Mountain Pine Beetle Outbreak (MPB)

Current Conditions

The environmental norm for much of the project area over the last several decades—closed-canopied mature/pole conifer forest—is in the midst of a conspicuous evolution as a result of the Forest-wide mountain pine beetle epidemic. Although the beetle outbreak appears mostly to have run its course after about 9 years, its consequences in terms of landscape-wide wildlife habitat transfiguration will continue to hold sway for decades, rivaling those of a large wildfire [Figure 52]. Of the four pine species in the Tenmile – South Helena project area susceptible to beetle attack, whitebark and limber pine are uncommon, but lodgepole and ponderosa pine are widespread components of forest stands. Lodgepole pine is predominant throughout much of the upper Tenmile drainage and higher elevations elsewhere and ponderosa pine is most common in lower and mid elevation areas southwest of Helena.

With the beetles nearly back to endemic population levels (pre-outbreak levels), lodgepole pine is now a dominant forest component only in areas with a good representation of seedling, sapling, or small pole-sized trees [trunks generally less than 5 inches in diameter at breast height (dbh)]. These trees are too small to have supported the pine beetles in most cases. The MPB has caused a shift away from lodgepole pine composition in areas with more shade tolerant components, primarily Douglas-fir and subalpine fir.



Figure 52. A stand of pure lodgepole pine east of Black Mountain with 90% of the overstory dead from mountain pine beetle infestation. A few small-diameter trees survive but, so far, little regeneration has come in to replace the dead overstory. Trees in this stand have been dead for at least 5 years and some have now fallen. Oct. 2014.



Figure 53. A ponderosa pine stand on the Mt Helena Ridge. Mountain pine beetle has killed roughly 40% of the overstory trees—and some have now fallen. Many mature pine trees, however, have been able to resist the beetles and, along with scattered Douglas-fir, make up the green canopy that remains here. Sept. 2014.



Figure 54. A beetle-impacted conifer stand in the upper Minnehaha Creek drainage. With the lodgepole pine overstory more than 90 percent dead, the stand is now dominated by subalpine fir, Engelmann spruce, and Douglas-fir. This multi-aged array of shade-tolerant conifers should produce a more dense and multi-layered forest than was previously present. Sept. 2014.

Conifer regeneration in the understories of beetle-impacted stands remains viable, but its distribution and density is highly variable. In some cases, a robust mix of species of various sizes is ready to replace the old stand as soon as the dead trees fall [Figure 54]. Other stands are virtually devoid of understory conifers and will take longer to return to a forested condition [Figure 52].

Short-term Future Conditions

Although most beetle-killed trees are still standing, they will be falling steadily through the next decade. At a number of sites throughout the project area, local wind events have toppled most of the dead pine, providing a preview of what the beetle-impacted landscape will look like in another 5-10 years. Figure 55 shows the result in a lodgepole pine stand.

Lodgepole Pine Stands

Before the next decade is out, forests formerly dominated by lodgepole pine will have little remaining canopy or very open-grown canopy, as supplied by non-pine species and lodgepole pine not attacked by the beetles (most of them with trunks less than 5-6 inches dbh). These sites will also be characterized by abundant coarse woody debris, only occasional standing dead trees, and regenerating confers of various species. Dispersion and density of both the overstory and understory will be irregular [see stand descriptions in the Forest Vegetation Report].

The change will be most dramatic in lodgepole pine stands. In terms of wildlife habitat, the following general conditions will be widespread in these stands in another 10 years:

- Movement through the stands will be complicated for large animals (and humans) in many areas because of stacked deadfall;
- Overhead canopy capable of providing effective shade, protection from the elements, and nesting and feeding sites for birds and small mammals will be less common;
- Sight distances will be long and hiding cover for large standing animals (elk, deer, bears, etc.) will be limited and patchy—although concealment cover for large bedded animals, young, and smaller species will be abundant in the accumulated deadfall;
- Opportunities for snag-dependent species—currently abundant—will be greatly diminished, while those for animals that make use of downed woody debris (for shelter, nesting, foraging) will proliferate;
- Given the loss of shading and the eventual decline of needle mats, ground level forage and cover in the form of grasses, sedges, forbs, and shrubs will increase on many sites (although overtopping woody debris will suppress it in many);
- Aspen will increase—in part because of the removal of conifer competition and in some cases because of accumulated deadfall blocking native ungulate browsing on young aspen shoots.



Figure 55. Beetle-killed lodgepole pine along the Continental Divide on the west edge of the project area. This one of several sites where dead trees, rather than toppling one by one, have been felled by a local wind event—providing a preview of how much of the landscape will appear in another 5-10 years when most beetle-killed trees are down. Standing snags are becoming uncommon; ground vegetation is robust. Green trees here are mature subalpine fir and Douglas-fir as well as a few seedling lodgepole pine. August 2014

In essence, closed-canopied forest with relatively “clean” understories, which have been the norm in a majority of lodgepole pine stands until recently, will have been replaced by

expansive uncanopied and open-canopied habitat underlain by a mass of woody debris and more robust ground vegetation. In the years that follow, young conifers emerging through the woody debris will proliferate and begin to regenerate the forest in irregular fashion.

Ponderosa Pine and Mixed Conifer Stands

Beetle-induced changes will be less dramatic in ponderosa pine stands because, in a majority of cases, a substantial number of mature trees have survived the beetle infestation [Figure 55]. The same is true for stands with a mixture of pines and other conifers that have not been affected by the beetles. Nonetheless, many of these stands will be more open and their understories more cluttered with coarse woody debris than in the past.

In sum: wildlife habitat will be evolving inexorably and noticeably over the next several decades.

Monitoring

- The Helena NF will monitor selected aspen clones to determine if browsing by native ungulates is suppressing regeneration on sites where establishment of healthy, multi-storied aspen stands is a priority. If survival of shoots and young trees is judged to be insufficient to accomplish recovery, fencing or other means will be used to protect the clones.
- The Helena NF will monitor goshawk nesting habitat in active home ranges to determine how the birds are adapting to new patterns of forest structure across the landscape.
- Winter tracking surveys will continue to follow habitat use patterns by lynx, wolverines, and other forest carnivores.
- Elk, mule deer, and other big game species will be a focus of Helena NF general wildlife surveys to determine how habitat use patterns change in response to the beetle outbreak and the Tenmile – South Helena Project. Population trends will be monitored by MFWP.
- Systematic bird surveys will be conducted in treated and untreated areas to detect differences in species composition, relative population density, and species diversity between areas of variable habitat structure.

Information Used, Methodology, and Scientific Accuracy

This section summarizes the information sources and methodology employed in the wildlife analysis and discusses the accuracy and precision of the result [see the 1969 NEPA Regulations: 40 CFR 1502.15]. Additional information appears in later sections dealing with individual species and habitat components. Much of the information presented in this analysis comes directly from field examination of the Tenmile – South Helena project area (See Wildlife Field Notes in the project record). Where direct observation of local wildlife habitat was not possible, inferences were made from scientific literature, wildlife survey work in surrounding areas, data from other resource shops, and discussions with other biologists. The basic approach has been to begin with

site-specific field data and then to use information from other sources, scientific research, and ecological theory to fill in data gaps and to provide a broader context for interpreting wildlife patterns.

Most of the habitats discussed here are described in some detail—and from different perspectives—in the Tenmile – South Helena Forest Vegetation Report and the Fire Regime Condition Class Background Report [all part of the Project Record]. A description of each of the treatment units in the project area, their status as wildlife habitat, and an assessment of the implications of potential vegetation treatment is in Tenmile – South Helena Project Unit-by-Unit Wildlife Assessment for Alternative 3. This assessment is backed by an array of field notes and photos of each unit taken during the period 2009-2014 [See Project Record].

The analysis in this report focuses on aspects of the environment that are of particular significance to wildlife. It does not provide an exhaustive review of all available habitat components. The tallies of wildlife species associated with different habitats come from personal observation in the project area during wildlife survey work (See Wildlife Field Notes in the project record); systematic surveys for landbirds, goshawks, elk, and forest carnivores; fortuitous observations reported by other biologists and field-going personnel; and studies summarized in the References section.

Some of the wildlife fieldwork in the project Area has been systematic enough to allow for a modicum of statistical inference: Forest Service Region 1 (R-1) landbird surveys, goshawk nest survey grids, and fisher hair sample surveys. But, most of the fieldwork in the project area, regardless of how much time and effort has been invested in it, has been too mercurial to allow for valid statistical analysis: Numerous species and habitat components are being investigated at the same time, survey routes are not consistently systematic, timing is erratic, species observations are often fortuitous, sample sizes of key species are inevitably small, and so on. On the other hand, observations are sufficient to indicate what species are consistently present, what their relative abundance is, what kinds of habitat conditions they are associated with, how they move through the project area, and how they react to human activity. In addition, habitat sites of key importance can be identified. In some cases, such as lynx/wolverine tracking backed by DNA analysis or tracking of radio-collared wolves, specific data as to the habitats of individual animals have been ferreted out. But these are exceptional cases.

The Information Used, Methodology, and Scientific Accuracy section pertains only to those habitats and species that are analyzed in the Wildlife Background Report and Biological Evaluation. Appendix A of the Wildlife Report summarizes the habitats and species that are carried forward in this analysis and the rationale for leaving out others.

Information and assumptions common to all wildlife habitats and species are as follows:

- R1-VMap is used to model and map wildlife habitat for selected species at the project and combined boundary. Intensified grid data are used to model habitat Forestwide.
- R1-VMap (VMap 14) is used to model and map wildlife habitat for selected species in the project area. R1-VMAP data are remotely sensed and represents a broad-scale, coarse filter depiction. It relies on satellite imagery and describes

three main vegetation components—canopy cover, tree dominance type, and stand size. R1-VMAP spatially represents habitats within the project area. Intensified grid data are used to model habitat Forestwide.

- The scale at which cumulative effects are measured varies among habitats and species. The respective scales are described in the Cumulative Effects section.
- The ArcMap geographic information system (GIS) is used to model, map, and quantify habitats and project impacts using accepted methodologies as described in the following sections.
- GIS data and product accuracy may vary. They may be (1) developed from sources of differing accuracy, (2) accurate only at certain scales, (3) based on modeling or interpretation, or (4) incomplete while being created or revised. Further, results may vary amongst products and outputs. Therefore, calculations (acres and miles) are usually expressed as ‘approximate’ to account for this variation. Using GIS products for purposes other than those for which they were created may yield inaccurate or misleading results.

Species Habitat Associations

Specialized species, like martens, fishers, pileated woodpeckers, and northern goshawks, are strongly tied to individual vegetative types, size classes, stand structural characteristics, topographic features, landscape-scale patterns, or combinations of the above for part of or most of their life cycles. Pileated woodpeckers, for instance, nest predominantly in large-diameter ponderosa pine or cottonwood snags (McClelland 1977); American martens occur within dense, mid- to late seral spruce-fir/lodgepole pine forests (Ruggiero et al. 1994); and goshawks nest within multi-storied, mid- to late seral forests at all but the highest elevations (Reynolds et al. 2006). Although these habitat associations are well-researched and accepted in the scientific community, “outliers” or uncommon occurrences of individuals using non-typical habitats do occur and are acknowledged in the literature. For instance, research shows that goshawks normally nest in mature conifer stands no less than 30 acres in size (Reynolds et al. 2006); yet McGrath et al. (2003), sampled nest stands that were much smaller. Younk and Bechard (1994) found goshawks in Nevada nesting in relatively small, widely spaced stands of aspen and foraging on ground squirrels in open shrubland habitat. McClelland (1997) found that pileated woodpeckers nested almost exclusively in ponderosa pine, cottonwood, and western larch (west of the Continental Divide), but also reported rare use of Douglas-fir snags.

Researchers acknowledge but typically disregard outlying results when developing models for species/ habitat associations. In this analysis, we assume that species sustainability is best modeled using what scientific literature and our own survey work identify as “typical” habitat for a species. This provides the general context for developing management plans for the project area and the surrounding landscape. Nonetheless, whenever our survey work in the project area has found “atypical” habitat relationships for key species, we have used that site-specific information in designing project alternatives.

Habitat models described in Samson (2005) are based on peer-reviewed literature, non-peer reviewed publications, particularly unpublished master’s theses and PhD

dissertations, research reports, and data accumulated by the Forest Service. Where possible, the peer-reviewed professional society literature is emphasized in that it is the accepted standard in science.

Literature published since 2000 was emphasized in that such recent publications review the previous literature and provide the best available and most recent science. Unpublished literature with a strong focus on unpublished master's theses and PhD dissertations provided information reflected in two to three year investigations into ecology, behavior, and/or habitat requirements of the four species described in Samson (2005). Such unpublished university-based information was important to provide detailed information on species given the possible lack of studies published in the professional peer-reviewed literature. See Samson (2005) for more information on how these habitat models were derived.

Limitations of Habitat Models

Habitat models are designed to relate the occurrence, and sometimes the abundance, of a species to environmental predictors (particular habitat features), which can then be used to map suitable habitat within a particular landscape (Barry and Elith 2006). These predictions as to what constitutes suitable habitat have inherent limitations, and it is important that decision makers are aware of them.

Habitat model limitations stem from two general types of errors: deficiencies in data and deficiencies in their ecological realism (Barry and Elith 2006). Data deficiencies arise from small sample sizes, lack of “absence” data for a species, non-random sampling, and missing variables that may be useful in explaining how the species relates to the environment. Further, the sheer variety of biotic and abiotic factors that comprise most species' ecological requirements makes it difficult to model their distribution, as do inter-species processes such as competition and predation (Ibid, p. 421).

As to realism: models are simplifications of complex biological systems and therefore cannot be perfectly predictive. Most habitat models are limited to vegetative structure and do not include other habitat variables (such as microclimate) and various life history phases (dispersal, territoriality). General models tend to be simpler than more specific and complex models—which generally enhances their clarity and increases their applicability over a broader range (Van Horne 2002 p. 64).

Habitat models that rely on point-of-detection (POD) data have been used successfully to predict habitat relationships and build species models (Peterson et al. 2002). Sergio and Newton (2003, p. 857) describe how (1) occupancy (point-of-detection) may be a reliable method for assessing habitat quality, especially for populations in which not all territories are occupied or for species in which checking occupancy is easier than finding nests”; (2) management should focus on maintaining or improving high quality occupied sites rather than dealing with poor, unoccupied sites; (3) occupancy data are often available, either from organized monitoring or fortuitous observation; and (4) long-term occupancy is a reliable measure of territory quality and thus can provide key information for management.

All this illustrates a basic truth noted by statistician G.P.E. Box, namely that, “all models are wrong, but some are useful” (Box 1976). The models described in Samson (2006) and summarized in Criteria for Wildlife Models Helena National Forest Version June 2009 (USDA 2009) are based on research findings and POD data collected in USFS Region One. They provide an imperfect approximation of what we can expect to find in terms of wildlife/habitat interactions throughout the project area, but the information, used properly, is very useful in directing fieldwork and indicating where active management needs to tread lightly.

Probability of Natural Disturbances: Mountain Pine Beetle Mortality

In western disturbance-prone forests, the distribution of habitats is strongly influenced by the severity and frequency of the natural disturbances. While these disruptions are inevitable, it is usually difficult to predict when, where, and to what extent they will occur. Because of this uncertainty, disturbances are disclosed as “risks.” Primary risks in ecosystems dominated by conifer forests are the probabilities of major wildfire and of forest insect and disease outbreaks. Other more erratic, but known risks include episodes of conifer winter-kill, sudden flooding and erosion, wind-shear blowdown events, landslides, and a variety of conditions related to global warming.

Of these potential disturbances, the mountain pine beetle (MPB) outbreak in the Divide landscape, and across the Helena NF as a whole, has swept beyond the threshold of “probable risk” and is now a well-documented environmental event. Because the beetle infestation has nearly run its course after more than 8 years, its magnitude and distribution can now be measured with a reasonable degree of certitude. Preliminary estimates for the Helena Ranger District as a whole put the area infested by mountain pine beetle at about 296,475 acres. Roughly 60 percent of the Helena NF landbase has been impacted by the beetles, although the intensity varies from one site to another.

Rate of Snag Attrition Following Mortality

Due to the mountain pine beetle (MPB) outbreak, the project area now has an abundance of dead lodgepole and ponderosa pine along with lesser numbers of dead whitebark and limber pine. Most beetle-killed snags are larger than 5 to 6 inches dbh. Douglas-fir snags have been generated by agents other than MPB and are scattered through the forest generally in low densities. The timing of when dead trees shift from vertical to horizontal position varies with tree species, tree age, the agents of mortality, and the local environment. But ultimately, the primary factor governing the rate at which trees fall in different environments is related to the speed of bole decay at the ground level (Mitchell and Preisler 1998). For ponderosa pine, this rate is typically governed by what has killed the tree. Whereas the Region-1 Snag Protocol (Ritter et al 2000) describes large ponderosa snags as being highly durable, it turns out that most snags produced by mountain pine beetles have fallen within a decade (Smith 2000). Another study found that beetle-killed ponderosa pine begin falling at a rapid rate about 5 years after death (USDA 2000).

In one study done on MPB-killed lodgepole, dead trees began falling 3 years after death in thinned (more open) stands, with 90 percent of the trees having fallen by year 12. In denser, unthinned stands trees began coming down 5 years after death, and 90 percent

were on the ground after 14 years (Mitchell and Preisler 1998). Trees fall sooner in more open stands because more wind can penetrate and because more sunlight speeds up bole decay (Mitchell and Preisler 1998). Similar results were found in fire-killed lodgepole pine in the Sleeping Child burn on the Bitterroot NF, where an average of 13.4 percent of the snags fell yearly (Lyon 1977).

The MPB outbreak in the Divide landscape first became evident in 2005-2006, and it has continued to generate large numbers of snags up to the present time (although at a decreasing pace since 2009). These snags have been toppling at an increasing rate over the past 3 years—a trend that will continue to accelerate over the next few years [Figure 52, Figure 55]. Once all the beetle-killed trees have fallen, the landscape will be devoid of a majority of lodgepole snags until the regenerating forests mature and slowly begin to accumulate new dead trees—not for 50 years or more. This "pulse" cycle of lodgepole pine snags is consistent with stand-replacing disturbance regimes. In the meantime, the supply of large downed woody debris will be abundant.

The rate at which snags are converted to logs will have substantial effects upon wildlife species dependent upon standing dead trees—all woodpeckers and a variety of other cavity users. Snag habitat, though widely available, will be decreasing throughout the next decade. Populations of dead tree dependent species that have been increasing since the advent of the beetle outbreak will decline as well. At the same time, habitat opportunities for species adapted to downed woody debris (marten, lynx, chipmunks, bushy-tailed woodrats, hares) will increase as the snags convert to logs.

Probability of Severe Wildfires following MPB Mortality

Wildfires are inevitable (Arno 2000; Arno et al. 1997). They are detrimental to some wildlife species, beneficial to others, and absolutely essential to a few (black-backed woodpeckers being a prime example). The nature of their effects often depends upon their magnitude and severity. Higher-than-normal severity wildfires that cover larger-than-normal expanses can cause problems for many species (Turner et al. 1994), especially when they occur on landscapes that historically had low or moderate severity wildfires, such as ponderosa pine forests. Wildfire severity is modeled using "FlamMap" or similar models and is based on factors such as stand density and structural complexity (ladder fuels) (Finney 2006). Models are commonly used to address the long-term sustainability of wildlife habitats. In most cases, changes in wildfire severity are considered an indirect effect upon wildlife. Effects are further qualified as to the degree that wildlife habitats can be sustained into the future based on the risks and severity of predicted fires.

There remains considerable discrepancy in the scientific literature as to the nature of the wildfire risk posed by accumulations of large woody debris. A majority of studies conclude that the rate of spread and intensity of fires can be elevated when stands of standing snags, mature forest stands, or young regenerating forest are underlain or interspersed with stacked deadfall (See Forest Vegetation Report). Some studies have concluded, however, that the volume of woody debris makes little difference and that fire behavior is driven primarily by the structure and condition of the overstory and weather conditions (See Forest Vegetation Report).

Much of the Divide landscape is at increasing risk of wildfire because of the accumulating fuel loading created by the pine beetle outbreak and because of the scarcity of fires over the past 100 years that, had they occurred more often, might have broken up the current fuel continuum.

Risk of Invasive Weeds on Disturbed Sites

Grasses and forbs underlying open, dry ponderosa pine/Douglas-fir stands provide habitat and forage for wildlife. Invasive weeds such as leafy spurge, spotted knapweed, and Dalmatian toadflax, which are well-adapted to dry sites, can out-compete native grasses and forbs and dramatically reduce the habitat quality. Actions that reduce the forest canopy and disturb the soil can make sites vulnerable to invasive weeds. Equipment used to thin forest canopies and roads used for vehicle access further increase the vulnerability of droughty sites to weeds in addition to inadvertently serving as carriers of the seed. While measures to avoid or contain the spread of invasive weeds can be effective, wildlife effects analyses must consider the risks of their introduction and their potential influence on habitat suitability.

This is primarily a concern in the drier eastern reaches of the project area and less so in the upper Tenmile drainage and the other higher elevation areas.

R1-VMAP and FIA Intensified Grid Data

R1-VMAP (Region 1 Vegetation Mapping Project) and FIA (Forest Inventory and Analysis) intensified grid data are two datasets used to describe habitats in this report. The essential difference in the derivation of data between the two systems is that R1-VMAP information comes from satellite-based remote sensing while FIA intensified grid data are from permanent on-the-ground plots surveyed by field workers.

R1-VMAP represents a broad-scale, coarse filter depiction. It relies on satellite imagery and describes three main vegetation components—canopy cover, tree dominance type, and stand size. VMAP produces a spatial view of habitats within the Tenmile – South Helena project area as well as at landscape level (the Divide landscape). Results can be mapped for areas both on and off the National Forest.

The FIA intensified grid data are point data and incorporate additional vegetation parameters not included in VMAP. For example, snag and woody debris data, which are collected as part of intensified grid surveys, cannot be derived from R1-VMAP. FIA point data also provide an opportunity to refine and verify the broad-scale spatial data derived from R1-VMAP. While FIA inventories provide statistically valid data for National Forest lands, the technique does not allow mapping of the results. The assumptions and limitations of both of these data sets are described in the Vegetation Overview Section.

Scientific Uncertainty

This analysis is based on the best available science; but because science is an ongoing process of testing and modifying existing knowledge so as to approach a new and more complete understanding of what is “real”, our current assemblage of information is (1) inevitably incomplete, (2) at least partially inaccurate, and (3) always changing.

“Scientific uncertainty, incomplete information, and controversy among experts are inescapable facets of the scientific process” (Clarke 2006). Uncertainty arises from factors such as complexity, natural variability, random variation, measurement error, and lack of knowledge (Ibid). As a result, this report is replete with expressions such as “approximately”, “about”, “it is estimated that...”, “we believe that...”, “it appears that...”, and so on. This is not an attempt to avoid responsibility for the information presented here, but merely the price of employing science as a basis for what we do. Table 74

Methodology

Table 74 describes the methodologies and information used to determine effects to wildlife and their habitats affected by the Tennile – South Helena project.

Table 74. Assumptions, information used, and methodologies used to determine effects to wildlife

WILDLIFE PARAMETER	ASSUMPTIONS AND INFORMATION USED	METHODOLOGIES AND SCIENTIFIC ACCURACY
<i>Driving Issues</i>		
Rocky Mountain Elk	<p>Data used to analyze effects to habitat are based on field observations and surveys.</p> <p><i>Elk herd units</i> were developed in conjunction with Montana Fish, Wildlife, and Parks.</p> <p><i>Summer range</i> is assumed to be the entire elk herd unit. <i>Winter range</i> is based on updated FWP range maps (2008).</p> <p><i>Elk security areas, hiding cover and thermal cover</i> are defined in the glossary. Hiding and thermal cover data are derived from R1-VMAP based in part on the following documents: <i>The Region 1 Existing Vegetation Classification System and its Relationship to Region 1 Inventory Data and Map Products</i> (USDA 2011) and <i>R1 Multi-level Vegetation Classification, Mapping, Inventory, and Analysis System</i> (USDA 2009b). Hiding and thermal cover models are described in the <i>Criteria for Wildlife Models Helena National Forest Version June 2009</i> (USDA 2009a).</p> <p>Hiding cover is based on the MFWP definition of 'a stand of coniferous trees having a crown closure of greater than 40 percent' (USDA 1986, p. II/18). The methodology for modeling hiding cover is described in USDA (2009a) and includes a consideration of stand age in areas that have experienced previous timber harvest and/or prescribed fire activity. Any stand that is less than 15 years old that has been treated with timber harvest or prescribed fire is not considered hiding cover. Conversely, stands that are greater than 15 years old and meet the requisite canopy cover of at least 40% are considered hiding cover. The trees in these stands are generally at least 5 feet tall although there is some variation. Tree height is generally 5 feet or greater in areas of mapped hiding cover; by the time canopy cover is $\geq 40\%$, trees are generally at least five feet. There will always be within stand variation, however. There is no tree height requirement for hiding cover in the Forest Plan. Hiding cover is based on canopy cover (See also Appendix B of the Wildlife Report). In order for a polygon to be considered hiding cover, it must be at least 40 acres in size pre and post project implementation. <i>The exception is remaining cover in security areas and intermittent refuge. The existing cover is comprised of 40 acres or more or 40%+ canopy cover while the remaining acres post implementation is not configured into 40 acre patches.</i></p>	<p>Analyses are based on site-specific information and scientific literature.</p> <p>Methodologies used to determine direct and indirect effects to elk include the following:</p> <p><i>Habitat effectiveness</i> (Lyon 1983) is based on motorized route densities open to the public during the summer (May 16 and October 14) and weighted according to the discussion below. Changes in open motorized route densities by alternative are disclosed as changes in habitat effectiveness as outlined in Lyon (1979). This analysis includes habitat effectiveness during project implementation and post implementation.</p> <p>Hiding cover and open road densities are analyzed for the post-implementation conditions as well as during project implementation (temporary roads, use of roads closed to the public) relative to Forest Plan Standards and include all motorized routes open between 10/15 and 12/1. Motorized routes are weighted according to their expected use: any road considered public is weighted by a factor of 1 (i.e. 1 mile = 1 mile) whereas any road considered private is weighted by a factor of 0.25 (i.e. 1 mile = 0.25 miles). This is based on research that indicates roads with less use have reduced impacts to elk (Perry and Overly 1976, Lyon 1979, Witmer and deCalesta 1985, Rowland <i>et al.</i> 2000). Private roads are assumed to receive less use than public roads as they generally are only available for use by the private landowner.</p> <p>Elk security is analyzed according to the following: <i>Security</i> is defined as a proportion of an elk herd unit within the administrative boundary of the Helena Ranger District that consists of an area of at least 1000 acres in size that is at least ½ mile from a motorized route open to the public between 9/1 and 12/1. Security blocks are adjusted for constrictions less than or equal to ½ mile in width. Security is calculated across all ownerships within the administrative boundary. <i>Intermittent Refuge Areas</i> are defined as those</p>

WILDLIFE PARAMETER	ASSUMPTIONS AND INFORMATION USED	METHODOLOGIES AND SCIENTIFIC ACCURACY
	<p>Thermal cover must be at least 15 acres in size pre and post project implementation with a canopy cover of at least 60%.</p> <p>Road density information is derived from transportation database. Private roads are assumed to have less impact on elk than public roads. Rowland <i>et al.</i> (2000) examined the relationship of open, closed, and administrative roads on elk habitat use. Administrative use of closed roads (restricted vehicle use, not open to the public) is assumed to be similar in impact as private roads. Rowland <i>et al.</i> (2000) found that open roads have the greatest impact on elk habitat use. Based on this and other research (Perry and Overly 1976, Lyon 1983, Witmer and deCalesta 1985) this analysis assigns a weight of 0.25 to private roads.</p> <p>Elk survey data are provided by MFWP area biologists for the respective hunting districts (MFWP 2002 – 2014). Elk analyses are also based on the <i>Montana Statewide Elk Management Plan</i> (2005a)</p> <p>The elk analysis is based on the guidelines found in the Framework for Project-Level Effects Analysis on Elk (MFWP and USDA 2013). The methodologies contained in this document are not direction and do not replace existing Forest Plan standards. For example, the security and habitat effectiveness analyses are NOT standards but methodologies used to describe effects to elk.</p> <p>Note, all logging (including precommercial thinning) and prescribed fire will remove hiding cover EXCEPT for the pre-commercial thinning associated with alternative 3 which was designed to retain hiding cover. All logging (including precommercial thinning) and mixed severity prescribed fire will remove thermal cover; low severity prescribed fire will not remove thermal cover.</p> <p>All road analyses are based on Divide Travel Plan existing condition transportation data.</p>	<p>areas at least 250 acres in size and less than 1000 acres in size that are greater than or equal to ½ mile from a motorized route open to the public between 9/1 and 12/1. Intermittent Refuge Areas are adjusted for constrictions less than or equal to ½ mile in width. Intermittent Refuge Areas are calculated across all ownerships within the administrative boundary.</p> <p>A cover consideration is also included in the security area analysis as follows:</p> <p>Cover should be distributed in a manner that mimics or approximates a natural range of variation (NRV). NRV is generally defined as the spatial and temporal variation in ecosystem characteristics under historic disturbance regimes during a reference period. A reference period should be sufficiently long to include the full range of variation produced by dominant natural disturbance regimes. Fire, wind, and insect/disease outbreaks are examples of disturbances.</p> <p>Provide cover, if available, in elk security areas to maintain and/or improve elk security in areas known to be used by elk or that have the potential to be used by elk.</p> <p>Provide cover, if available, between elk security areas to maintain habitat <i>connectivity</i> and facilitate seasonal movement.</p> <p>Invasive weed risk is assessed qualitatively based upon droughty sites where crown closure is low due to MPB, soils are disturbed by equipment, and mitigation measures (rapid re-vegetation, spot herbicide treatment, etc.) are applied.</p>
Mule Deer	<p>Data used to analyze effects to habitat are based on field observations and surveys.</p> <p>Mule Deer winter range is based on updated FWP range maps (2008).</p> <p>Hiding and thermal cover data are derived from R1-VMAP based in part on the following documents: <i>The Region 1 Existing Vegetation Classification System and its Relationship to Region 1 Inventory Data and Map Products</i> (USDA 2011) and <i>R1 Multi-level Vegetation Classification, Mapping, Inventory, and Analysis System</i> (USDA 2009b).</p> <p>Hiding and thermal cover models are described in the Criteria for Wildlife Models Helena National Forest Version June 2009 (USDA 2009a).</p>	<p>Analyses are based on site-specific information and scientific literature.</p>

WILDLIFE PARAMETER	ASSUMPTIONS AND INFORMATION USED	METHODOLOGIES AND SCIENTIFIC ACCURACY
	<p>All logging (including precommercial thinning) and mixed severity prescribed fire will remove thermal cover; low severity prescribed fire will not remove thermal cover.</p> <p>Mule deer survey data are provided by MFWP area biologists for the respective hunting districts.</p>	
Canada Lynx	<p>The Helena National Forest Plan was amended March 2007 by the Northern Rockies Lynx Management Direction (NRLMD). The NRLMD applies only to lynx habitat identified as occupied. The project area is considered occupied; therefore, the NRLMD applies (See USDA 2007a). Furthermore, lynx are listed on the Helena National Forest Species List, prepared by the U.S. Fish and Wildlife Service according to the July 23, 2015 species list. The project area is not in lynx critical habitat.</p> <p>Habitat estimates and maps are derived from R1-VMAP and Pfister et al. (1977) and are based on the Eastside Assessment-Wide Wildlife Habitat Parameters for Results and Expected Trends (2014). Methodologies and assumptions associated with these data are described in the following documents in addition to Pfister et al. (1977): The Region 1 Existing Vegetation Classification System and its Relationship to Region 1 Inventory Data and Map Products (USDA 2011) and R1 Multi-level Vegetation Classification, Mapping, Inventory, and Analysis System (USDA 2009b). See also the Vegetation Introduction for additional information and assumptions.</p> <p>Data for lynx are derived from survey efforts and the Montana Natural Heritage Program (See http://nhp.nris.mt.gov/).</p> <p>The lynx is identified as an animal species of concern by the Montana Natural Heritage Program (accessed August 25, 2015).</p>	<p>Analyses are based on the NRLMD and Lynx Conservation and Assessment Strategy (Interagency Lynx Biology Team 2013).</p> <p>Because an updated version of R1-VMAP has been utilized for this analysis, field data will occur to validate the habitat values.</p>
Wetland Habitats and Riparian Zones	<p>Information used to analyze effects on wetland habitat and riparian zones is based on data summarized in the Hydrology Specialist Report.</p> <p>Information associated with wildlife in wetland habitats and riparian zones is derived from the Partners in Flight Bird Conservation Plan Montana (Montana Partners in Flight 2000), Coordinated Implementation Plan For Bird Conservation In Western Montana (Montana Steering Committee 2005) and Montana's Comprehensive Fish and Wildlife Conservation Strategy (MFWP 2005b).</p> <p>Source data on wetlands is from the US Fish and Wildlife Service wetlands and deepwater habitats feature class in the project record, and is supplemented with information gained from reviewing imagery.</p>	<p>Analyses are based on site-specific information and scientific literature.</p> <p>Landbird surveys are based on the Northern Region Monitoring Program Point Count Protocol 2007 (Avian Science Center 2007a).</p> <p>The Wetland Habitats and Riparian Zones section also includes a discussion of willow flycatchers and moose. See Migratory Birds and Moose below.</p>

WILDLIFE PARAMETER	ASSUMPTIONS AND INFORMATION USED	METHODOLOGIES AND SCIENTIFIC ACCURACY
Cool Moist Forested Habitat	<p>Information associated with wildlife in cool moist forested habitats is derived from the Partners in Flight Bird Conservation Plan Montana (Montana Partners in Flight 2000), Coordinated Implementation Plan For Bird Conservation In Western Montana (Montana Steering Committee 2005), and Montana's Comprehensive Fish and Wildlife Conservation Strategy (MFWP 2005b).</p> <p>Cool Moist Forested Habitats are based on information in the Forest Vegetation Report.</p>	<p>Analyses are based on site-specific information and scientific literature.</p> <p>Landbird surveys are based on the Northern Region Monitoring Program Point Count Protocol 2007 (Avian Science Center 2007).</p> <p>Cool moist forested habitats section also includes a discussion of Cassin's finches and olive-sided flycatchers. See Migratory Birds, below.</p>
<i>Other Prominent Issues</i>		
Dry Forested Habitat	<p>Information associated with wildlife in dry forested habitats is derived from the Partners in Flight Bird Conservation Plan Montana (Montana Partners in Flight 2000), Coordinated Implementation Plan For Bird Conservation In Western Montana (Montana Steering Committee 2005), and Montana's Comprehensive Fish and Wildlife Conservation Strategy (MFWP 2005b).</p> <p>Dry Forested Habitats are based on information in the Forest Vegetation Report.</p>	<p>Analyses are based on site-specific information and scientific literature.</p> <p>Landbird surveys are based on the Northern Region Monitoring Program Point Count Protocol 2007 (Avian Science Center 2007).</p> <p>Dry forested habitats section also includes a discussion of flammulated owls and Cassin's finches. See Flammulated Owls and Migratory Birds, below.</p>
Snags and Down Woody Debris Habitat	<p>Snag and down woody debris data are derived from the Summary Database. Methodologies and assumptions associated with these data are described in the following documents: R1 Grid Intensification using CSE Protocols – Field Procedures (USDA 2010), R1 Multi-level Vegetation Classification, Mapping, Inventory, and Analysis System (USDA 2009b), and FIA Field Guides, Methods, and Procedures at http://fia.fs.fed.us/library/field-guides-methods-proc/. See also the Forest Vegetation Report for additional information and assumptions.</p> <p>Snag data are also derived from the Estimates of snag densities for eastside forests in the Northern Region (Bollenbacher et al. 2008) which replaces the R1 Snag Protocol (Ritter et al. 2000).</p> <p>Treatments in grasslands and shrub habitats are assumed to have the potential for the greatest effects to dead wood habitat. Efforts to remove conifers in these habitats would create an immediate snag source as trees are killed through prescribed fire. However, as conifer colonization is setback, as is the goal in these biophysical settings, fewer large trees will be available for future snags. Intermediate harvest treatments and prescribed fire prescriptions should result in the retention of more snags than regeneration harvest prescriptions. Assumptions related to snag</p>	<p>Analyses are based on site-specific information and scientific literature.</p> <p>Woodpecker surveys are based on A Field Protocol to Monitor Cavity Nesting Birds (Dudley and Saab 2003) and the Northern Region Landbird Monitoring Program Field Methods (Avian Science Center 2007a).</p> <p>Pileated and hairy woodpeckers, Williamson's sapsuckers, and martens are discussed in this section.</p> <p>See also the Forest Vegetation Report for scientific accuracy and methodologies associated with landscape level FIA data and FIA grid intensification plots. See American Marten, Pileated Woodpecker, Hairy Woodpecker and Migratory Birds, below.</p>

WILDLIFE PARAMETER	ASSUMPTIONS AND INFORMATION USED	METHODOLOGIES AND SCIENTIFIC ACCURACY
	<p>recruitment as a result of prescribed fire are described in the Forest Vegetation Report.</p> <p>Down woody debris habitat is described qualitatively.</p>	
Habitat Fragmentation	<p><i>Fragmentation</i> effects are based on the impacts that proposed treatments have within and between stands on <i>patch</i> size integrity. Effects are described qualitatively.</p>	<p>Analyses are based on site specific information and scientific literature.</p>
Travel Corridors and Linkage Zones	<p>The Region 1 <i>Connectivity Protocol</i> (USDA 1997) was reviewed for background information.</p> <p>The Tenmile – South Helena project area lies within what has been characterized as the although it is also referred to as the Continental Divide “travel corridor”, “migration corridor”, or “habitat corridor” (Walker and Craighead 1997).</p> <p><i>Connectivity</i> is discussed relative to the local connectivity and regional connectivity (Servheen et al. 2001). Conceptual elements of linkages are described in Craighead and others (2001).</p>	<p>Analyses are based on site specific information and scientific literature.</p>
Grizzly Bear	<p>The grizzly bear are considered present in the project area according to the July 23, 2015 U.S. Fish and Wildlife Service Species List (See Project Record). Information used to analyze project effects to grizzly bears is derived literature contained within the <i>NCDE Grizzly Bear Conservation Strategy</i> (See http://www.fws.gov/mountain-prairie/science/PeerReviewDocs/NCDE_Grizzly.pdf).</p> <p>The project area occurs in Zone 2 where the objective is to maintain existing resource management and recreational opportunities and allow agencies to respond to grizzly bear/human conflicts while providing the opportunity for grizzly bear dispersal between the Northern Continental Divide Ecosystem (NCDE) and other ecosystems.</p> <p>The grizzly bear is identified as an animal species of concern by the Montana Natural Heritage Program (accessed August 25, 2015).</p>	<p>Analyses are based on open roads and total roads in the Divide South landscape.</p> <p>Treatment effects on forage are based on habitat types that provide grizzly bear food sources (Zager <i>et al.</i> 1983, IGBC 1986). The habitat types include: Douglas-fir/bearberry, Douglas-fir/huckleberry, subalpine fir/alder, subalpine fir/bead lily, subalpine fir/blue joint, subalpine fir/grouse whortleberry, subalpine fir/huckleberry, subalpine fir/twinflower, subalpine fir/whitebark, and spruce types.</p>
Wolverine	<p>Data for wolverines are derived from survey efforts and the Montana Natural Heritage Program (See http://nhp.nris.mt.gov/).</p> <p>Effects to wolverines are based on models developed by Inman <i>et al.</i> (2013) and Copeland et al (2010): <i>areas of persistent spring snow</i>,</p>	<p>Analyses are based on site-specific information and scientific literature.</p> <p>Methodologies for wolverine habitat are located in Copeland <i>et al.</i> (2010) and Inman <i>et al.</i> (2013).</p>

WILDLIFE PARAMETER	ASSUMPTIONS AND INFORMATION USED	METHODOLOGIES AND SCIENTIFIC ACCURACY
	<p><i>maternal habitat, primary habitat, male dispersal, and female dispersal.</i></p> <p>The wolverine is also identified as an animal species of concern by the Montana Natural Heritage Program (accessed August 25, 2015).</p>	
Old Growth Dependent - Northern Goshawk	<p>Data used to analyze effects to habitat are based on field observations.</p> <p>Goshawk habitat models are derived from <i>A Conservation Assessment of the Northern Goshawk, Black-backed Woodpecker, Flammulated Owl, and Pileated Woodpecker in the Northern Region USDA Forest Service</i> (Samson 2005), <i>Habitat Estimates For Maintaining Viable Populations of the Northern Goshawk, Black-backed Woodpecker, Flammulated Owl, Pileated Woodpecker, American Marten, and Fisher</i> (Samson 2006), and the <i>Criteria for Wildlife Models Helena National Forest</i> (USDA 2009a). See those documents for methods and assumptions. See also the <i>Forest Vegetation Report</i> for additional information and assumptions.</p> <p>Model values are based on R1-VMap values and include the following: nest habitat - <i>dominant</i> tree types Douglas-fir, ponderosa pine, lodgepole pine, and aspen as well as mixed stands that include these types, tree sizes greater than 10" in diameter, and canopy cover $\geq 25\%$; foraging habitat - <i>dominant</i> tree types Douglas-fir, ponderosa pine, lodgepole pine, subalpine fir, and aspen as well as mixed stands that include these types and canopy cover $\geq 40\%$. Diversity matrices are also used to describe foraging habitat and the PFA (USDA 2009b). Samson (2005, 2006) and USDA (2009a) provide a detailed rationale on the basis for these structural characteristics used to describe goshawk habitat.</p> <p>Landscape level <i>old growth</i> estimates are non-spatial and are based on FIA and intensified grid data. Old growth polygons at the 3rd order drainage scale are mapped using stand exam data.</p> <p>Regeneration and intermediate harvest, precommercial thinning, and mixed severity prescribed fire are all assumed to remove nesting habitat. Regeneration harvest is assumed to remove foraging habitat; however, these treatments would most likely yield habitat for prey species different than those associated with the original stand. All other treatments in forage are assumed to retain sufficient structure to accommodate the prey species associated with the original stand.</p> <p>Habitat estimates and maps are derived from the HNF Intensified Grid Summary Database. Methodologies and assumptions associated with these data are described in the following documents: <i>The Region 1 Existing Vegetation Classification System and its Relationship to Region 1 Inventory Data and Map Products</i> (USDA 2011), <i>R1 Multi-level</i></p>	<p>Goshawks surveys are based on the <i>Northern Goshawk Inventory and Monitoring Technical Guide</i> (Woodbridge and Hargis 2006).</p> <p>Analyses are based on site specific information and scientific literature.</p> <p>Effects to goshawk habitat are based on impacts to habitat modeled according to Samson (2006) as described in <i>Criteria for Wildlife Models Helena National Forest</i> (USDA 2009a) AND based on changes in vegetation diversity as described in <i>Northern Goshawk Northern Region Overview: Key Findings and Project Considerations</i> (USDA 2009c). See reference for assumptions and a discussion of the scientific uncertainty surrounding goshawk conservation.</p> <p>See also the <i>Forested Vegetation Report</i> for scientific accuracy and methodologies associated with landscape level FIA (Forest Inventory and Analysis) data and FIA grid intensification plots as well as common stand exams.</p> <p>The PFA is based on a buffer of 730 meters around the known nest site which is equivalent to ~420 acres. PFAs are only identified for known nests since delineation of the PFA depends on the presence of a known nest. Home ranges are not mapped since home ranges can overlap amongst goshawk pairs. The home range analysis is based on an average home range size of 5,000 acres.</p>

WILDLIFE PARAMETER	ASSUMPTIONS AND INFORMATION USED	METHODOLOGIES AND SCIENTIFIC ACCURACY
	<p><i>Vegetation Classification, Mapping, Inventory, and Analysis System</i> (USDA 2009b), and FIA Field Guides, Methods, and Procedures at http://fia.fs.fed.us/library/field-guides-methods-proc/.</p> <p>The goshawk is also identified as an animal species of concern by the Montana Natural Heritage Program (accessed August 25, 2015).</p>	
Migratory Birds	<p>Migratory bird surveys evaluated for this project originate from the <i>Northern Region Landbird Monitoring Program</i>, 1994 to 2004, [data are in project record] and Montana Natural Heritage Program Database. The <i>Cornell Birds of North America</i> at http://bna.birds.cornell.edu/bna was used for additional habitat information; the North American Breeding Bird Survey Results and Analysis at http://www.mbr-pwrc.usgs.gov/bbs/bbs.html is used to identify trends.</p>	<p>Analyses are based on site-specific information and scientific literature.</p> <p>Surveys are based on the <i>Northern Region Landbird Monitoring Program Field Methods</i> (Avian Science Center 2007a).</p>
<i>Species Discussed in Habitat Sections</i>		
Flammulated Owl	<p>Data used to analyze effects to habitat are based on field observations and systematic surveys (Cilimburg 2006, Smucker and Cilimburg 2008). Data for flammulated owls are also derived from the Montana Natural Heritage Program (See http://nhp.nris.mt.gov/).</p> <p>The flammulated owl is identified as an animal species of concern by the Montana Natural Heritage Program (accessed August 25, 2015).</p>	<p>Flammulated owl surveys are based on the <i>Northern Region Landbird Monitoring Program Flammulated Owl Protocol</i> (Avian Science Center 2007b).</p> <p>Flammulated owls are described qualitatively in the dry forested habitat section.</p>
Mature-Forest Dependent – American Marten	<p>Data on martens are based field surveys and on the Montana Natural Heritage Program (See http://nhp.nris.mt.gov/).</p> <p>Marten habitat is assumed to be represented by the mid to high elevation forests (See lodgepole pine & mixed conifer type in the <i>Forest Vegetation Report</i>). Snags and down woody debris are assumed to be the limiting habitat factor for martens for this analysis.</p> <p>Effects to martens are based on the following assumptions: harvest in canopied forests and mixed severity prescribed fire would remove marten habitat.</p> <p>Habitat for martens is based on information provided in <i>Habitat Estimates For Maintaining Viable Populations of the Northern Goshawk, Black-backed Woodpecker, Flammulated Owl, Pileated Woodpecker, American Marten, and Fisher</i> (Samson 2006).</p> <p>Habitat estimates are derived from the HNF Intensified Grid Summary</p>	<p>Effects to Snags and Down Woody Debris are also applicable to this analysis. The methodology to determine effects to snags are described above under <i>Snags and Down Woody Debris</i>.</p> <p>Analyses are based on site specific information and scientific literature.</p> <p>See also the <i>Forest Vegetation Report</i> for scientific accuracy and methodologies associated with landscape level FIA data and FIA grid intensification plots.</p>

WILDLIFE PARAMETER	ASSUMPTIONS AND INFORMATION USED	METHODOLOGIES AND SCIENTIFIC ACCURACY
	<p>Database. Methodologies and assumptions associated with these data are described in the following documents: <i>The Region 1 Existing Vegetation Classification System and its Relationship to Region 1 Inventory Data and Map Products</i> (USDA 2011), <i>R1 Multi-level Vegetation Classification, Mapping, Inventory, and Analysis System</i> (USDA 2009b), and FIA Field Guides, Methods, and Procedures at http://fia.fs.fed.us/library/field-guides-methods-proc/.</p> <p>See also the <i>Forest Vegetation Report</i> for additional information and assumptions.</p>	
Old-Growth Dependent – Pileated Woodpecker	<p>Data used to analyze effects to habitat are based on field observations. Data for pileated woodpeckers are also derived from the Montana Natural Heritage Program (See http://nhp.nris.mt.gov/).</p> <p>Pileated woodpecker habitat is assumed to be represented by the lower elevation ponderosa pine/Douglas-fir forests (see Douglas-fir & ponderosa pine types in the <i>Forested Vegetation Report</i>). Snags and down woody debris are assumed to be the limiting habitat factor for pileated woodpeckers for this analysis.</p> <p>Effects to pileated woodpeckers are based on the following assumptions: intermediate and regeneration harvest and prescribed fire would remove pileated woodpecker habitat. Precommercial thinning would not.</p> <p>Habitat for pileated woodpeckers is based on information provided in <i>Habitat Estimates For Maintaining Viable Populations of the Northern Goshawk, Black-backed Woodpecker, Flammulated Owl, Pileated Woodpecker, American Marten, and Fisher</i> (Samson 2006).</p> <p>Habitat estimates are derived from the HNF Intensified Grid Summary Database. Methodologies and assumptions associated with these data are described in the following documents: <i>The Region 1 Existing Vegetation Classification System and its Relationship to Region 1 Inventory Data and Map Products</i> (USDA 2011), <i>R1 Multi-level Vegetation Classification, Mapping, Inventory, and Analysis System</i> (USDA 2009b), and FIA Field Guides, Methods, and Procedures at http://fia.fs.fed.us/library/field-guides-methods-proc/.</p> <p>The pileated woodpecker is also identified as an animal species of concern by the Montana Natural Heritage Program (accessed August 25, 2015).</p>	<p>Pileated woodpecker surveys are based on the <i>Northern Region Landbird Monitoring Program Field Methods</i> (Avian Science Center 2007a).</p> <p>Effects to Snags and Down Woody Debris are also applicable to this analysis. The methodology to determine effects to snags are described above under Snags and Down Woody Debris.</p> <p>Analyses are based on site specific information and scientific literature.</p> <p>See also the <i>Forest Vegetation Report</i> for scientific accuracy and methodologies associated with landscape level FIA (Forest Inventory and Analysis) data and FIA grid intensification plots.</p>
Snag Dependent – Hairy Woodpecker	<p>Data used to analyze effects to habitat are based on field observations. Data for hairy woodpeckers are also derived from the Montana Natural</p>	<p>Hairy woodpecker surveys are based on the <i>Northern Region Landbird Monitoring Program Field Methods</i> (Avian</p>

WILDLIFE PARAMETER	ASSUMPTIONS AND INFORMATION USED	METHODOLOGIES AND SCIENTIFIC ACCURACY
	<p>Heritage Program (See http://nhp.nris.mt.gov/).</p> <p>Hairy woodpecker habitat is assumed to be the entire project area. Snags and down woody debris are assumed to be the limiting habitat factor for hairy woodpeckers for this analysis.</p> <p>Effects to hairy woodpeckers are based on the following assumptions: intermediate and regeneration harvest would remove nesting and foraging habitat while prescribed fire and precommercial thinning would not.</p> <p>Habitat for hairy woodpeckers is based on snag data and snag availability.</p>	<p>Science Center 2007a).</p> <p>Effects to Snags and Down Woody Debris are also applicable to this analysis. The methodology to determine effects to snags are described above under <i>Snags and Down Woody Debris</i>.</p> <p>Analyses are based on site specific information and scientific literature.</p> <p>See also the <i>Forest Vegetation Report</i> for scientific accuracy and methodologies.</p>
Moose	Information for these big game species is derived from MFWP data, field observations, and other records.	These big game species are described qualitatively.
<i>Topics not Analyzed in Detail</i>		
Aspen	Information on aspen is based on the <i>Forest Vegetation Report</i> for additional information and assumptions.	<p>Analyses are based on site-specific information and scientific literature.</p> <p>Effects are qualitative.</p>
Whitebark Pine	<p>Vegetation data and field reconnaissance were used to determine the extent of whitebark pine.</p> <p>Information associated with wildlife in whitebark pine habitats is derived from the <i>Partners in Flight Bird Conservation Plan Montana</i> (Montana Partners in Flight 2000) and the <i>Coordinated Implementation Plan For Bird Conservation In Western Montana</i> (Montana Steering Committee 2005).</p> <p>See also the <i>Forest Vegetation Report</i>.</p>	<p>Analyses are based on site specific information and scientific literature.</p> <p>Effects are qualitative.</p>
Old Growth Forests	Old growth in the Tenmile – South Helena project area is based on stand exam inventory and intensified grid data. Old growth definitions are based on Green <i>et al.</i> (1992). See the <i>Forest Vegetation Report</i> for more detailed information on old growth forest methodologies.	<p>Analyses are based on site-specific information and scientific literature.</p> <p>Effects are qualitative except for goshawks.</p>
Edges and Ecotones	<i>Edge</i> and <i>Ecotone</i> effects are based on the impacts that proposed treatments have on edges and ecotones.	Effects are described qualitatively.

WILDLIFE PARAMETER	ASSUMPTIONS AND INFORMATION USED	METHODOLOGIES AND SCIENTIFIC ACCURACY
Grasslands and Shrub Habitat	Vegetation data and field reconnaissance were used to determine the extent of grasslands and shrub habitat.	Analyses are based on site-specific information and scientific literature and are qualitative in nature.
White-tailed Deer, Black Bear, and Mountain Lion	Information for these big game species is derived from MFWP data, field observations, and other records.	These big game species are described qualitatively.
Wolves	Information on wolves is derived from MFWP (2003, 2009a, 2009b), Wildlife Services, field observations, and anecdotal data.	Wolves are described qualitatively.
Boreal Toad	Data on boreal toads are based on Werner <i>et al.</i> (2004), Maxell <i>et al.</i> (2003), and the Montana Natural Heritage Program (See http://nhp.nris.mt.gov/). The boreal toad is also identified as an animal species of concern by the Montana Natural Heritage Program (accessed August 25, 2015).	Boreal toads are described qualitatively.
Fisher	Data on fishers are based field surveys and on the Montana Natural Heritage Program (See http://nhp.nris.mt.gov/). Data are also derived from the Federal Register: June 30, 2011; vol. 76, no. 126, p. 38509, 38513. The fisher is identified as an animal species of concern by the Montana Natural Heritage Program (accessed August 25, 2015).	The fisher is described qualitatively.
Black-backed Woodpecker	Data used to analyze effects to habitat are based on field observations and data collected in areas associated with wildfire and in the Birds and Burns study area. The black-backed woodpecker is identified as an animal species of concern by the Montana Natural Heritage Program (accessed August 25, 2015).	Black-backed woodpecker surveys are based on <i>A Field Protocol to Monitor Cavity Nesting Birds</i> (Dudley and Saab 2003) and <i>Northern Region Landbird Monitoring Program Field Methods</i> (Avian Science Center 2006 (2007a)). Black-backed woodpeckers are described qualitatively.
<i>Other</i>		
Viability	Viability analyses are based on the Northern Region Viability Protocol (Samson 1997). Samson (2005 and 2006) in <i>A Conservation Assessment of the Northern Goshawk, Black-backed Woodpecker, Flammulated Owl, and Pileated Woodpecker in the Northern Region</i> and <i>USDA Forest Service Habitat Estimates For Maintaining Viable Populations of the Northern Goshawk, Black-backed Woodpecker, Flammulated Owl, Pileated Woodpecker, American Marten, and Fisher</i> summarizes the status of viability for the northern goshawks, pileated woodpeckers, and American martens. Habitat models are derived from <i>A Conservation Assessment of the</i>	Acre estimates for existing habitat for northern goshawks, marten, and pileated woodpeckers are derived by multiplying the percent habitat estimates (derived from the summary database) by total forested acres on the Helena National Forest (978,799 acres). Viability analyses for the remaining species include an examination of the abundance and distribution of the respective species compared to population data where available.

WILDLIFE PARAMETER	ASSUMPTIONS AND INFORMATION USED	METHODOLOGIES AND SCIENTIFIC ACCURACY
	<p><i>Northern Goshawk, Black-backed Woodpecker, Flammulated Owl, and Pileated Woodpecker in the Northern Region, USDA Forest Service</i> (Samson 2005), <i>Habitat Estimates For Maintaining Viable Populations of the Northern Goshawk, Black-backed Woodpecker, Flammulated Owl, Pileated Woodpecker, American Marten, and Fisher</i> (Samson 2006), and <i>Criteria for Wildlife Models Helena National Forest</i> (USDA 2009a).</p> <p>Habitat estimates are derived from the HNF Intensified Grid Summary Database. Methodologies and assumptions associated with these data are described in the following documents: <i>The Region 1 Existing Vegetation Classification System and its Relationship to Region 1 Inventory Data and Map Products</i> (USDA 2011), <i>R1 Multi-level Vegetation Classification, Mapping, Inventory, and Analysis System</i> (USDA 2009a), and FIA Field Guides, Methods, and Procedures at http://fia.fs.fed.us/library/field-guides-methods-proc/.</p>	
Cumulative Effects Analysis	The Forest Activity Tracking System (FACTS) and the Schedule of Proposed Activities (SOPA) are used to identify past, present, and reasonably foreseeable projects.	The impacts of past activities on species' specific habitat are based on changes to stand structure relative to species' habitat requirements.

Wildlife, Affected Environment

Environmental Baseline

The “Affected Environment” section summarizes baseline information on wildlife habitats, wildlife populations, and environmental processes characteristic of the project area and the surrounding landscape. This provides a context for gauging the effects of environmental changes that can be expected under different action alternatives (alternatives 2 and 3). The affected environment is synonymous with the conditions that would prevail under the “no action” alternative (alternative 1).

Because of the pervasive influence of the mountain pine beetle epidemic, which has coursed through Helena NF pine forests since 2006, forest conditions in the project area and throughout much of the surrounding landscape are atypical of what has been the norm over the past several decades, and they do not reflect what Helena NF planners envisioned when devising Forest Plan management goals for wildlife in the early 1980s [HFP, p. II/11 – II/21]. Roughly half the forest stands in the project area are dominated by mature/pole lodgepole pine forests, the overstories of which are now mostly dead. As a consequence, overstory conditions, which have already become more open with the loss of foliage, are about to change even more dramatically over the next 5 to 10 years as dead trees fall.

In the following sections, the affected environment for wildlife is described primarily in terms of what is present on the ground today. However, the implications of the evolving forest structure for local wildlife associations over the next decade are considered as well.

Hierarchy of Issues

Following direction in the National Environmental Policy Act (NEPA), those wildlife issues with potential to be “truly significant to the action in question” are emphasized and those of “other-than-significant issues” are abbreviated in their analyses [40 CFR 1500, 1502]. The following aspects of the wildlife resource are emphasized in this analysis:

- Species, habitat features, and environmental processes that have some real potential to be measurably impacted by timber harvest, thinning, and prescribed burning at the scale proposed under the two action alternatives;
- Species or habitat components that might be affected to an extent that designated thresholds (standards, guidelines) are approached or crossed under any of the alternatives;
- Species whose normal routines might be seriously disrupted by human activity during project implementation on a scale that could disrupt local populations;
- Focal habitat features, the functioning of which might be impaired by environmental conditions arising from any of the alternatives;
- Selected issues that, for one reason or another, have proven controversial in the public arena over the past few years.

Analysis Areas

The Forest Service NEPA Handbook provides direction for identifying appropriately sized analysis areas for given species and habitats. The Tenmile – South Helena project area is of sufficient size to assess cumulative effects for most species given the large size of the project area. For other species, including grizzly bears and wolverines, the project area is too small to accurately identify cumulative effects. Figure 56 illustrates the analysis scales used to assess the direct, indirect, and cumulative effects of project alternatives on all of the species and habitats included in this report. Table 75 describes the analysis areas used for each species and habitat analyzed in this report.

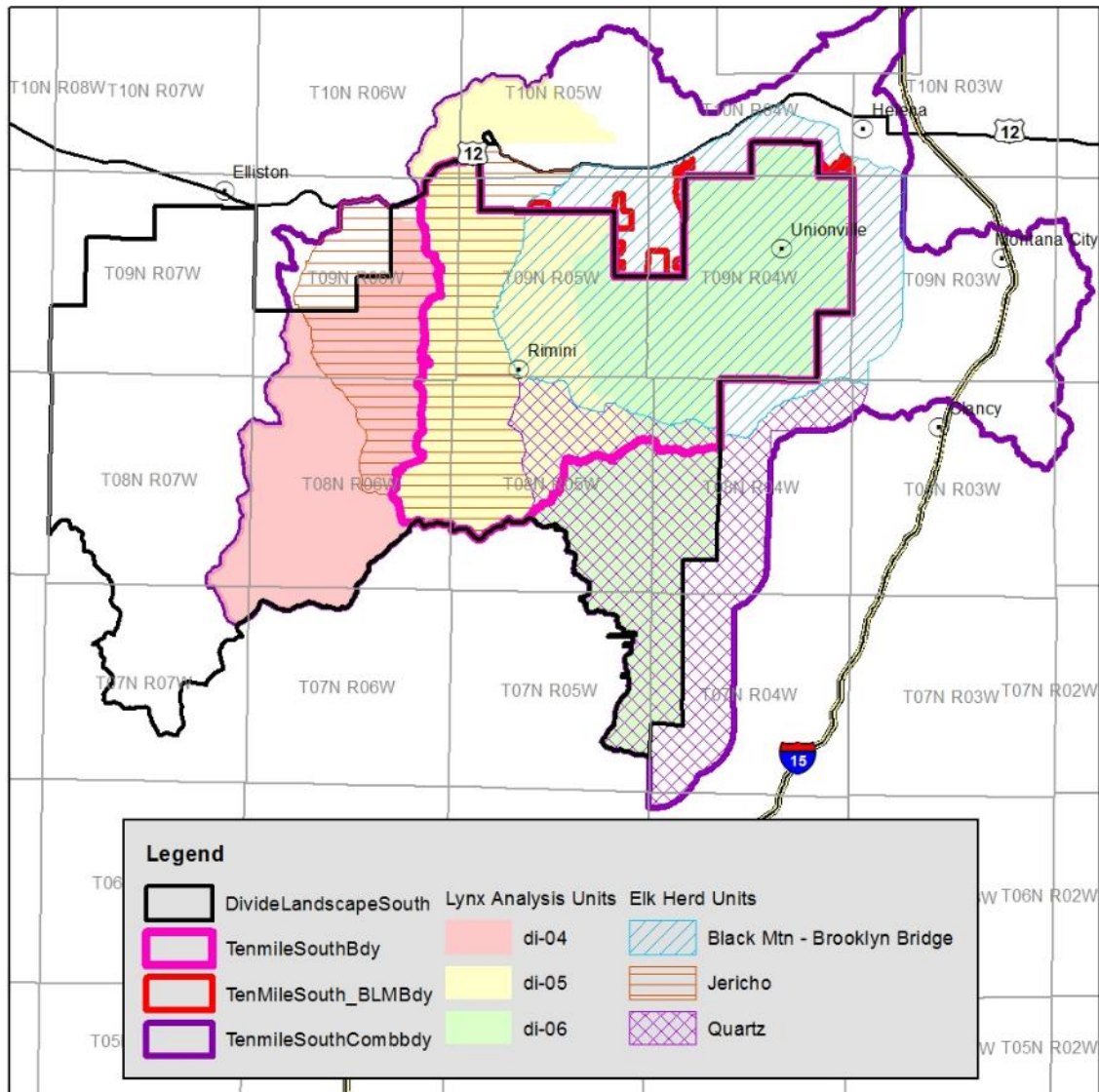


Figure 56. Wildlife analysis areas for the Tenmile – South Helena project

Table 75. Scale of analysis for species and habitats within the Tenmile – South Helena project

Wildlife Species and Habitats	Analysis Area
Big Game Species	
Elk	Herd Unit
Mule Deer	Project Area
TES Species	
Grizzly Bear	Divide Landscape - South
Canada Lynx	Lynx Analysis Unit
Fisher	Project Area
Wolverine	Divide Landscape - South
Black-backed Woodpecker	Project Area
Flammulated Owl	Project Area
Boreal Toad	Project Area
Townsend's Big-eared Bat	Project Area
Other Management Indicator Species	
Northern Goshawk	Project Area
Pileated Woodpecker	Project Area
Hairy Woodpecker	Project Area
American Marten	Project Area
Habitats	
Dry Forested Habitats	Project Area
Cool Moist Forested Habitats	Project Area
Old Growth	Project Area, Third Order Drainage
Wetland Habitats and Riparian Zones	Project Area
Aspen	Project Area
Whitebark Pine	Project Area
Grasslands and Shrub Habitats	Project Area
Snags and Down Woody Debris ¹	Project Area
Travel Corridors and Linkage Zones	Divide landscape - South
Fragmentation, Edge, and Ecotones	Project Area
Additional	
Migratory Birds	Analyzed in the context of their associated habitats
Viability	Forest

Driving Issues

Elk

Affected Environment

Elk Biology

The Rocky Mountain elk (*Cervus elaphus nelsoni*), although it evolved in isolation from other elk during the Pleistocene glaciation, is today little different from other subspecies of elk in North America or, for that matter, from most subspecies in Europe and Asia (O’Gara 2002, p. 47-62). Though reduced to small remnants across the west by the late

1900s, Rocky Mountain elk populations are now robust. Montana Fish, Wildlife and Parks, the Forest Service, and other agencies manage elk to provide a surplus for hunters while holding populations well above levels required for viability. Although the well-being of local subpopulations of elk is sometimes threatened by human development, overharvest, and habitat shortcomings, the overall population viability of elk in the northern Rockies has not been at risk since the early 20th century (Cooperrider 2002, p. 518-521).

Elk are one of the more manageable wildlife species: their habitat needs are well studied and they respond readily to habitat change and population manipulation. Because of their influence on plant community composition and structure, their competitiveness with other herbivores, and their role as a food source for numerous carnivores (including humans), some biologists consider elk to be a keystone species in Rocky Mountain ecosystems (Cooperrider 2002, p. 518-524). Elk are management indicators for hunted species on the Helena NF and most other National Forests in Region 1—a role that may be misplaced because of their adaptability and generalist tendencies (Ibid, p. 523-524).

Elk occur in a variety of habitats including mountain forests and meadows, grasslands, shrublands, and highly managed forests (Skovlin et al. 2002, p. 531-532). Prior to Euro-American settlement, elk in Montana were commonly observed in the grasslands and river bottoms of the Great Plains year-round. It is likely that these plains dwelling populations spread well to the east and intermingled with those of now-extinct eastern elk subspecies (O’Gara 2012, p. 55-56). Today, however, due to habitat alteration in the valleys and on the prairies (mostly from livestock and crop raising) and the extirpation of elk from areas of human settlement, most elk find summer range in mountain grasslands, meadows, and conifer forests, and descend to ranges in the foothills and valleys only in winter (Skovlin et al. 2002, p. 531-537).

Managing for elk has become increasingly complex as human activities have affected habitat quality and access. Management requires meeting basic habitat needs and understanding the socioeconomic value of elk. Primary considerations in elk management (Lonner 1991) include:

- Maintaining habitat security to protect elk during the hunting season;
- Preserving/recovering desired elk population characteristics as determined by elk managers and distributions relative to land management;
- Satisfying the growing demand for quality hunting and non-hunting experiences.

Methodologies have evolved over the years to measure the status of elk populations and their vulnerability to land management practices, hunting, wildlife viewing, and the ever-increasing presence of people throughout elk habitat. These approaches are generally organized around seasonal habitat needs: Summer range, winter range, and hunting season security habitat.

Elk Management Units

Coordinating Helena NF and MFWP Elk Management

Helena Forest Plan standards and guidelines for big game are designed to maintain habitat conditions on the National Forest that help Montana Fish, Wildlife, and Parks

(MFWP) meet its goals for local elk populations. MFWP's primary tool in managing elk is the manipulation of hunting regulations: setting harvest quotas for different sex/age classes, defining hunting areas, setting seasons, arranging for block management on private lands. The Forest Service is able to influence the equation by managing vegetation (cover and forage) and controlling hunter vehicle access on different parts of the Forest. In spite of this reasonably well-defined division of responsibility, management coordination remains complicated by technical issues.

First, the quality of aerial survey data on which MFWP bases much of its annual population estimates can vary widely from year to year and from one hunting district to another. This is a function of weather conditions; snow cover; variable elk movement patterns; type of aircraft; timing; and inherent viewing difficulty imposed by local topography, forest vegetation, and artificial obstructions (powerlines, fences) [Legislative Audit Division 2002, p. 21-36]. The survey data (along with harvest statistics) are key to determining what adjustments MFWP needs to make to its hunting regulations each year. Trends in this data over time also suggest what the Helena NF needs to consider in terms of cover distribution and vehicle restrictions on its road and trail system. Changes to these components, particularly forest cover, are difficult, if not impossible to make on a year-to-year basis as elk populations shift.

Another complication stems from a mismatch in scale of analysis units. MFWP sets elk population objectives, makes population estimates, and adjusts hunting regulations for hunting districts (HD), which, in the Divide landscape average about 250,000 acres (around 400 square miles) and cover as much private, State, BLM, and municipal land as they do National Forest. The Helena NF, on the other hand, organizes its habitat management around elk herd units (EHUs), which in the Divide landscape may be as small as 35,000 acres, but average a bit less than 60,000 acres (around 90 square miles); see Figure 57. The problem, then, is to determine how conditions in an elk herd unit contribute to the population status of elk on a hunting district three to eight times its size given the diversity of conditions in other herd units and non-Forest land that feed into the scenario.

In many cases, it is possible to scrutinize the MFWP flight data and divide hunting districts into distinct segments in terms of how local elk populations fare in each area. In HD 335, for example, MFWP winter surveys are concentrated along the eastern edge of the hunting district and near Colorado Gulch and Tennmile Creek at US 12 on the north. Elk on winter range on the eastern part of the district may use areas on HD 338, as well, as it borders the southwest side of Helena. However, the elk using that portion of HD 338 are most likely coming off summer range in HD 335.

Local Elk Management Units

Historically, the term "elk herd unit" has been used to define the total area used by a herd of elk in the course of one year's movement from summer to winter range—which, in the Divide landscape, inevitably includes areas outside the National Forest boundary. The area used by an elk herd may be quite fluid from one year to the next depending on forage condition, weather, snow cover, human disturbance, and so on. In addition, elk that spend the summer together on the National Forest may split into 2 or more groups when descending to winter range and diverge to different wintering areas. Some of these

elk may remain on or close to the National Forest; others may move well out into the valleys and foothills away from the Forest boundary and not return until spring.

To complicate matters, the Forest Service typically applies the term “elk herd unit” to fixed analysis units that serve to delineate habitat blocks for reasonably coherent groups of elk. In any given year, however, the biological herd unit defined by the movement of the elk may not coincide with the static unit mapped by the Forest Service. The Divide landscape has been divided into six elk herd units (EHUs)—delineated in 2003 by Helena NF and MFWP biologists (and modified in 2009) [see Figure 57]. Herd units include all lands within Helena NF boundaries, public and private, and adjacent land out to 1.5 miles beyond the boundaries—excluding obvious areas of non-habitat, such as the City of Helena. This extension delineates an off-Forest area used by elk that may remain at least partly connected to the National Forest throughout the winter and may be influenced by resource management there. Most herd unit boundaries have been drawn along primary drainage bottoms so that the EHUs encompass relatively cohesive regions of elk summer range at higher elevation. EHUs are used to calculate compliance with Forest Plan Big Game standards 2, 3, and 4a (HFP, pp. II/17-18).

The Tenmile – South Helena project boundary includes portions of three EHUs: Jericho, on the west; Black Mountain-Brooklyn Bridge on the northeast; and Quartz Creek in the southeast. Note that the project boundary is adjacent to the boundary of two others, but does not include any area of those EHUs (Little Blackfoot-Spotted Dog and Greenhorn). See Figure 57 below.

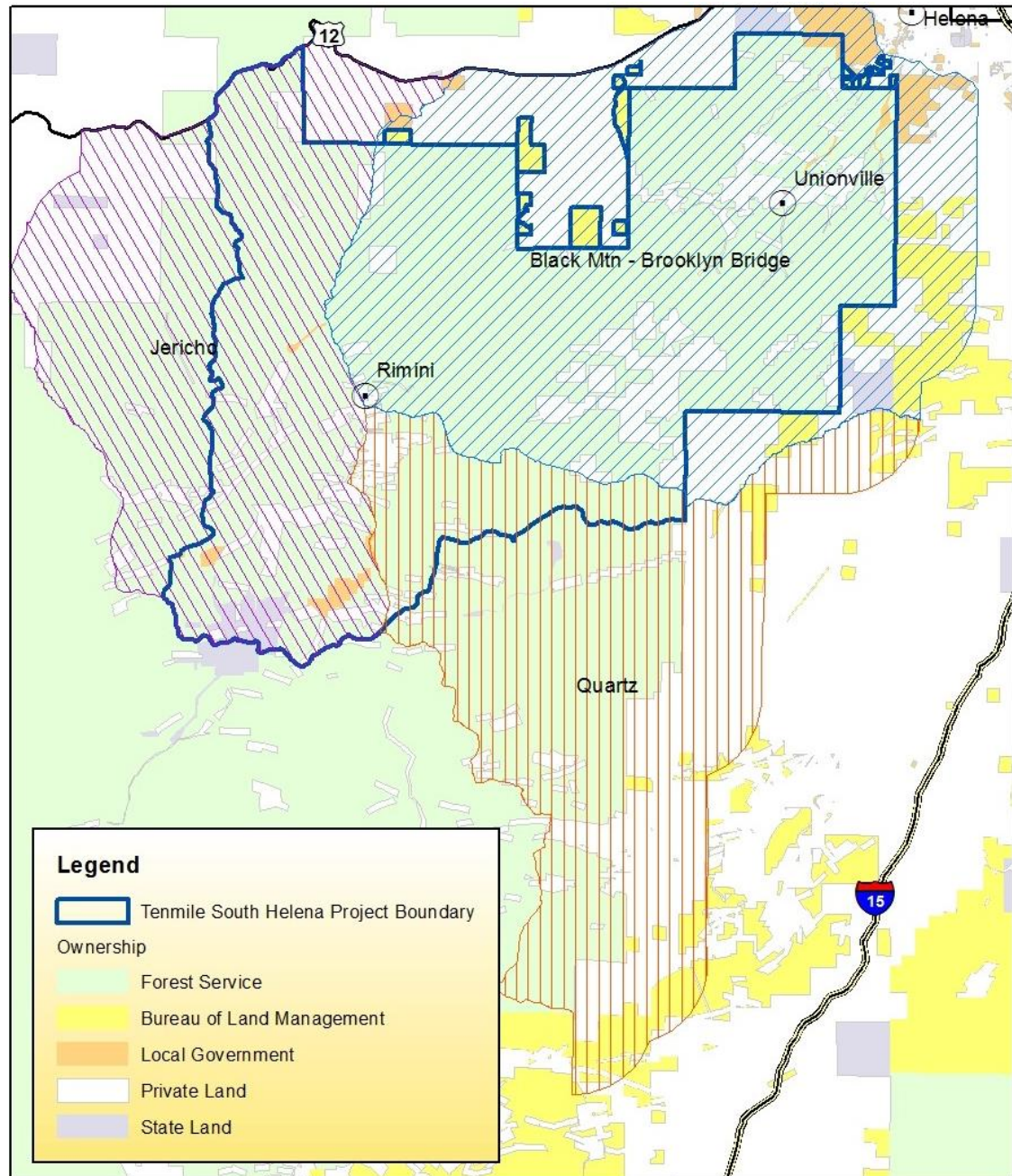


Figure 57. Elk herd units in the Tenmile - South Helena project vicinity.

Table 76 below indicates the EHUs in which the project occurs. The column “Total Acres in EHU” includes all public and private land within administrative boundaries of the Helena NF plus the 1.5 mile extension beyond the Forest boundary. The category “EHU Acres within Helena NF Administrative Boundaries” is larger than “Total Acres of Helena NF land within EHU” due to non-Forest inholdings inside the administrative boundary. These two categories indicate the proportion of each EHU over which the Helena NF has management control. A map of the three local elk herd units in Figure 57 shows both the on-Forest herd units and the 1.5 mile extension beyond the Forest boundary.

Table 76. Elk herd units (EHU) that have portions within the Tenmile – South Helena project area

Elk Herd Unit (EHU)	Total acres in EHU	EHU acres within the HNF administrative boundary	Total acres of Helena NF land within each EHU	Total acres of BLM land within each EHU	Acres of BLM within the project	Total acres of the EHU in the project	Percent of EHU in project
Black Mountain-Brooklyn Bridge	53,840	35,874	29,617	3,725	1,043	36,917	69%
Jericho	35,345	29,364	23,567	0	0	18,408	52%
Quartz Creek	36,733	23,036	19,959	2,644	0	6,069	17%
Combined Total	125,918	88,274	73,143	6,369	1,043	61,394	49%

Black Mountain-Brooklyn Bridge Elk Herd Unit

The Black Mountain-Brooklyn Bridge EHU is adjacent to the city of Helena, extending west to Tenmile Creek and south to a line delineated by Beaver Creek and Corral Gulch. On the east it extends 1.5 miles past the Forest boundary along Corral Gulch. The EHU is about 53,840 acres of mixed ownership. About 45 percent of the herd unit is in non-Forest ownership.

Most of the Black Mountain-Brooklyn Bridge EHU provides winter and summer habitat for elk. Vegetation ranges from relatively open grasslands among patches of ponderosa pine and Douglas-fir at low elevations on the north and east edges of the unit to extensive stands of lodgepole pine and Douglas-fir at higher elevations. There have been few wildfires since the 1940s (corporate database records). Lodgepole pine has been decimated by the recent mountain pine beetle outbreak – in many areas nearly all mature trees are dead or dying. In the drainage headwaters there are numerous small, wetlands of various sizes and types from open meadows to forested wetlands. Some wetlands are ephemeral, receiving their water from snowmelt and heavy rain, while others may persist throughout the growing season. Most of the wetlands are disconnected features in a drainage, but there are some linear features associated with short riparian reaches. For more information on wetlands in the project area, see the “Wetland Habitats and Riparian Zones” section of this report.

There is a large area of fall elk security habitat in the west-central part of the EHU, about 5,781 acres. In addition, there are four intermittent security areas ranging from 347 to 734 acres. When fall snows deepen, elk move to lower elevations, the largest area being the lower foothills near and south of Helena. Montana Fish, Wildlife, and Parks surveys have observed elk numbers at or above the hunting district (HD 335) objective in eight of the last ten years. Bull: cow ratios have been at the objective (>10:100); calf: cow ratios have been highly variable.

There has been relatively little timber management in the EHU, and most of it has occurred on the south and east borders of the EHU near private land.

Jericho Elk Herd Unit

The Jericho Mountain EHU (Figure 57) lies south of U.S. Highway 12, extending westward from Tennile Creek over the Continental Divide to Telegraph Creek. It includes private land in the valleys off its northern edge and encompasses a total of 35,345 acres—29,364 acres within Helena NF administrative boundaries. Aside from the valleylands to the north, most private land in the EHU is on old mining claims—including part of the town of Rimini. Approximately 33 percent of the EHU is in private ownership. Much of the northern half of the herd unit is occupied by the 9,440-acre Jericho Mountain inventoried Roadless Area, located mostly on the east side of the Divide in the Tennile Creek watershed, but extending westward into the Telegraph Creek drainage in the vicinity of Mike Renig Gulch and Jericho Mountain. This largely unroaded habitat block provides most of the fall elk security in the Jericho EHU. The Tennile – South Helena project area occupies the eastern half of the herd unit.

Some of the montane grasslands in the northern end of the unit above Lazyman and Mike Renig Gulches provide winter habitat for elk in most winters. The rest of the unit is fall/spring transitional range and summer range, with viable summer habitat concentrated in the southern half toward the headwaters of Tennile and Telegraph Creeks and their tributaries. Most of the unit is covered with mature forest (much of it deteriorating from mountain pine beetle infestation in lodgepole pine). Grasslands occur in the northern end of the unit and at a few locations along the Divide. Wet meadows also break the forest continuum in some areas: those in Flume Gulch, Sure Thing Swamps, Sally Ann Creek, and upper Ontario Creek west of the Tennile – South Helena project area are particularly productive as summer wildlife habitat.

Extensive clearcutting (mostly in the 1970s and 1980s) in the greater Hahn Creek and upper Telegraph Creek drainages west of the Divide also serves to disrupt the contiguity of the mature forest. The bulk of this harvest is in the nearby Telegraph Project vicinity. Cutting units are now dominated by regenerating conifer saplings, many of which provide hiding cover for big game animals. The Tennile drainage, east of the Divide, serves as part of the water supply for the City of Helena, and as a result, has seen very limited timber harvest on public land over the past several decades. Forest cover is ubiquitous, but as with other areas in the Divide landscape that are dominated by pine forests, mountain pine beetle has killed a majority of the overstory lodgepole pine. Most of these trees remain standing, but increasing numbers have been falling since the outbreak began.

There is a large area of fall elk security habitat in the Jericho Mountain roadless area – about 3,435 acres. In addition, there is one intermittent security area at 923 acres.

Historic logging (dating from the late 19th and early 20th centuries) and mining have generated a widespread road system; some roads remain open to vehicle use while others are closed. Summer habitat effectiveness—based on areas free from motorized use—is quite good. Because the herd unit is relatively close to the City of Helena and other local population centers, fall hunting pressure is high.

Quartz Creek Elk Herd Unit

The Quartz Creek EHU is in the southeastern part of the project area, and most of the EHU is outside the project area. Its northern border is the Black Mountain - Brooklyn Bridge EHU, the northwestern border is the Jericho EHU, the remaining western boundary is the Beaverhead-Deerlodge National Forest. The eastern border is the 1.5 mile extension past the Forest boundary. The Quartz Creek EHU is about 36,733 acres – with 23,036 acres inside the HLCNF boundaries.

The whole of the Quartz Creek EHU provides summer elk habitat, and the eastern two-thirds provides winter habitat, as well. The upper elevations on the west against the Beaverhead-Deerlodge NF are lodgepole pine stands, with Douglas-fir dominating the forested stands moving east. At the lower elevations, the Douglas-fir transitions to a more open configuration interspersed with large openings. There are wetlands in the EHU, and the largest are associated with privately-owned mining sites. There are large wetlands near Chessman Reservoir and a string of riparian-associated wetlands along upper Quartz Creek.

There are two intermittent security areas in this EHU (377 and 747 acres). As this EHU is in the same hunting district as the Black Mountain – Brooklyn Bridge EHU, the elk population estimates and ratios are the same.

There has been relatively little timber management in the EHU, and most of it has occurred on the north end of the EHU near private land.

MFWP Population Management – Hunting Districts

The Tenmile – South Helena project area boundary falls entirely within Hunting District 335. However, a substantial portion of the Jericho EHU does lie within HD 215 (west side of the continental divide south of US 12). Three other hunting districts share a border with the project area: HD 318, HD 343, and HD 388. Elk in MFWP surveys in HD 335 may be observed in the portion of HD 388 southwest of Helena, but, again, these animals are likely coming off summer range in HD 335. There may be some overlap, as well, in the vicinity of Tenmile Creek at US 12 by elk from HD 343. However, because the activities proposed for this project are clearly in HD 335, and the Helena NF elk herd unit boundaries encompass three EHUS in the project boundary, HD 335 and HD 215 will be the only hunting districts considered for this analysis.

MFWP garners much of its information as to the status of elk populations in each hunting district from annual aerial surveys of winter range. Most surveys are flown between mid-January and mid-March when most elk are in the open in traditional wintering areas. Aerial surveys are not intended to be complete counts, but are designed to provide relative between-year comparison of the number of elk visible, bull/cow ratios, calf/cow ratios, and so on. This provides information on trends that can then be used to adjust regulations from year to year. An estimate of actual population size, if needed, can be obtained by applying a “visibility bias correction factor” [Legislative Audit Division 2002, p. 21-36].

Hunting District 335

Hunting District 335 (“Helena South”) is a relatively compact unit that lies east of the Continental Divide and south of U.S. Highway 12. It encompasses the eastern half of the Jericho EHU and includes the entire Tenmile – South Helena project area. Helena NF lands make up the western 55 percent of the hunting district, with the eastern portion of the Jericho EHU accounting for about 13 percent of the district. The eastern reaches of HD 335 extend out over private, BLM, and State land in the adjacent foothills and Prickly Pear Valley south of Helena. The northern end extends off the Forest to U.S. Highway 12 between Helena and MacDonald Pass.

Much of the area east of the National Forest boundary is occupied by grassland and shrubland with patches of forest. Much of the area is ranchland, but there is also considerable human settlement—towns, subdivisions, individual dwellings—along the major drainages and eastward toward Interstate 15. Also, the industrial mining complex at Montana Tunnels has usurped a broad area in the foothills in the Clancy Creek drainage. Most of the viable elk winter range in HD 335 is located in this region east of the Helena NF boundary. A smaller area of winter range is located along the northern border of the district between the Forest boundary and Highway 12. Some of the elk that spend the summer and fall in HD 335 winter here, while others continue northward across the highway to winter range in HD 343.

As is typical with most hunting districts in this area, elk security is centered on traditional unroaded areas on the National Forest, but also depends to a certain extent on blocks of private land where public hunting is limited to one degree or another. HD 335 supports two relatively large elk security areas—one centered in the Lazyman Gulch Roadless Area southwest of Helena and another in the Jericho Mountain Roadless Area on the west side of the upper Tenmile Creek drainage (and extending over the Divide). A few other security areas are scattered about the National Forest portion of the district—some fairly small and serving more as intermittent refuge areas than as “full service” security areas capable of holding elk through the hunting season.

Despite the checkered security, the elk population in HD 335 has remained relatively consistent in structure and size over three decades, meeting MFWP objectives for numbers, bull/cow ratios, and calf production and survival in most years (Table 77). This population and structure exists in spite of its proximity to Helena which leads to more hunting pressure than in most hunting districts in Region 3. Recent road closures under the Clancy-Unionville Vegetation and Travel Management Project have helped to expand fall security in this area.

Table 77. Numbers of elk observed and bull/cow and calf/cow ratios during aerial winter range surveys in HD 335 compared to the Montana Elk Plan objectives.

Year	Number of elk counted	Bulls/100 cows	Calves/100 cows
1999	380	8	17
2000	614	18	38
2001	513	11	56
2002	529	13	18
2003	569	12	32
2004	418	12	42
2005	555	13	35
2006	771	10	27
2007	776	13	35
2008	667	12	15
2009	450	Not reported	Not reported
2010	388	13	32
2011	670	19	45
2012	998	16	28
2013	827	9	23
2014	1,187	10	26
Average last 5 years	814	13	31
Objective	480 - 720	≥ 10	≥ 30

MFWP winter range surveys (Table 77) show that, on average, the elk population remained in the 570-580 range prior to 2004. Since then, it has moved upward, with counts for the last three winters exceeding the upper range of MFWP objectives by a considerable amount. MFWP biologists have felt that this trend has been driven by mild winters, increased travel restrictions in the Clancy-Unionville area of the Helena NF, and fewer hunting permits for antlerless elk (MFWP HD 335 Elk Survey 2005, 2007). The counts for 2009 and 2010 are an anomaly in this otherwise positive trend. As in some other local districts, MFWP believes that the lower counts in these years were a function of a less effective survey method and of elk having moved off winter range by the time surveys were conducted [see the post-season survey of elk in HD 335 for 2010 and 2011 in the Project Record]. There was no evidence of a sudden increase in hunter success, elevated natural mortality, or decreased calf production/ survival that might have initiated a downward trend in elk numbers. By 2011, the count was back up to where it had been prior to 2009, and well within the population objective for HD 335 (600 elk \pm 20 percent).

Bull/cow ratios have been fairly consistent over the last five years, averaging 13 bulls/100 cows. The 2011 count was the highest in the last 15 years at 19 bulls/100 cows. The objective for the hunting district is a minimum of 10 bulls/100 cows. Mature bulls (greater than 2 ½ years old) have accounted for only about two percent of the count during this period. This statistic can be somewhat volatile from one year to another—partly because hunter success at killing bulls is variable but also because the older bull elk have an aptitude for eluding detection. The current percentage of mature bulls does

appear to be a clear improvement over those of past decades. As with the bull/cow ratio in general, this is probably a result of road closures on the National Forest and targeted hunting regulation by MFWP.

Calf/cow ratios have been more variable over the last several years, ranging from 15 calves/100 cows (2008) to 45 calves/100 cows (2011). The average for the last 5 years is 31 calves/100 cows—which is typical of hunting districts in this area and indicates a level of calf production and survival sufficient to maintain current elk populations under a normal regime of hunting and natural predation. The lower numbers for 2012 and 2013 are consistent with a drop in calves counted in other local hunting districts in those years, and thus may reflect general weather/climate phenomena.

MFWP feels that elk in HD 335 are being impacted by livestock grazing, partly on the Helena NF, but more so on privately-owned winter ranges. Because natural forage is limited, elk turn to agricultural fields and haystacks stockpiled for winter livestock feed. This, in turn, has led to ranchers requesting special hunts to trim elk numbers. MFWP believes that the big Montana Tunnels mine east of the Forest on Clancy Creek has reduced winter range opportunity for elk (and more so for mule deer) in the area southwest of Jefferson City east of the Forest boundary.

Hunting District 215

Hunting District 215 (“East Deerlodge”) is a large unit that lies west of the Continental Divide and south of U.S. Highway 12, extending west to Interstate 90 and south across the Beaverhead-Deerlodge NF. It encompasses the Spotted Dog–Little Blackfoot EHU, as well as western portion of the Jericho EHU. These two herd units combined cover 90 square miles within Helena NF boundaries and occupy the northeastern 16 percent of the hunting district, which covers roughly 565 square miles. The Tenmile – South Helena project area is not a part of this hunting district, but it is adjacent to the project, and the Forest’s Jericho EHU is in part in the hunting district.

The northern portion of HD 215 (about 45 percent of the hunting district) covers the southwest quadrant of the Divide landscape (118 square miles) and the private and state lands northeast of Deerlodge (142 square miles). MFWP considers this to be a key area for elk. An average of 67 percent of the elk in the hunting district has been counted on these northern winter ranges since 2000, and the population has been increasing steadily since around 2005. Table 78 summarizes some of the data from MFWP aerial surveys conducted on winter (and occasionally, spring) range in HD 215 since 1982 (data are from the Montana Fish, Wildlife and Parks website and from MFWP aerial survey reports).

Table 78. Numbers of elk observed and bull/cow and calf/cow ratios during aerial winter range surveys in HD 215 compared to the Montana Elk Plan objectives

Year	Number of elk counted	Bulls/100 cows	Calves/100 cows
1999	Not reported	Not reported	Not reported
2000	Not reported	Not reported	Not reported
2001	Not reported	Not reported	Not reported
2002	799	5	32
2003	Not reported	Not reported	Not reported
2004	465	13	38
2005	894	6	35
2006	953	6	40
2007	Not reported	16	31
2008	1,365	Not reported	Not reported
2009	1,759	21	38
2010	1,716	18	34
2011	1,957	19	37
2012	2,206	14	17
2013	2,493	12	19
2014	2,234	Not reported	Not reported
Average last 5 years	2,121	15	27
Objective	1,120-1,680	≥ 10	≥ 30

In the northern sector (45 percent) of HD 215, elk winter range is located in the valleys and hill country west of the Helena NF and north of Cottonwood Creek (which flows into the Clark Fork River at Deer Lodge). Winter range counts are usually conducted sometime from late January to mid-March (depending on weather conditions and plane availability). Occasionally, spring surveys have been done instead of or in addition to the winter counts. Spring surveys, typically run in late April and early May, find most of the elk in the open mountain grasslands on the western and northern edges of the southern Divide landscape on or near Helena NF ground.

In Table 78, the total number of elk shown for 2004-2005 is an underestimate—stemming from factors associated with the flights in those years; but the trend of steadily increasing population over the past decade is evident. The population is well above the objective of 1,120 elk in this district. The bull/cow ratio, on the other hand, while still above MFWP objectives, has not improved. Beyond that, the percentage of mature bulls in the population has decreased in recent years, with bulls older than 1.5 years accounting for only about two percent of the population in 2012 and 2013. This is an indication of hunting pressure too heavy for the available security on fall range. Overall bull numbers have remained adequate only because of a profusion of spike bulls [2012, 2013 Elk Surveys in HD 215; R. Vinkey, personal communication 2014 with Brent Costain, Helena NF wildlife biologist].

Table 78 also shows that calf numbers are down in 2012 and 2013, usually an indication of disruptive weather, poor adult nutrition, or heavy predation. Currently the reason for the drop-off in calf production/survival is unknown, but there has been no sign of an increase in predation pressure in this area. A number of wolf packs have centered their activity along the western edge of the Helena NF and in the adjacent ranchlands since 1995, but until 2012, calf/cow ratios remained in the range of 30-40 calves/100 cows year after year (and the overall population continued to increase). With the removal of wolves from the Endangered Species List and the advent of the State wolf hunting season in 2010, the ability of wolves to impact livestock and big game populations in this area has been minimal. Wolves attacking livestock have been dispatched quickly, and there has been no evidence of their having built up sufficient strength to measurably affect the local elk population. So, something else is at work here.

Security areas available to elk in the northern part of HD 215 in the Jericho and Spotted Dog–Little Blackfoot elk herd units cover a substantial amount of ground in large part due to the Electric Peak Roadless Area in the southwest corner of the Divide landscape. The problem for local elk is that, because of its elevation and topographic position, much of this area becomes unavailable to them during part of the hunting season as snow builds up and the forage base shrinks. This is true for most of the other security areas in this part of the Forest as well. How long elk are able to remain in National Forest security areas depends on fall weather in any given year, but often they are forced down into transitional and winter ranges on the edge of the Forest and on private/State lands where hunting season security can be marginal.

Until recently, elk moving off the Forest to the west had been able to settle in a large block of private ranchland in the Spotted Dog country, which had been off-limits to public hunting. Elk began moving to this winter range area as early as the start of the bow season in September. The move may be a direct response to pressure from bow hunters and motorized recreation on the Forest, but it may also reflect an established pattern of migration down to secure and benign valley habitat regardless of other circumstances. MFWP felt that the refuge provided by this private land suppressed hunting opportunity and allowed the elk population to maintain itself well in excess of Montana Elk Management Plan objectives (although mature bull numbers remained low) (MFWP 2005a). In August 2010, the State was able to purchase most of this land and convert it to a Wildlife Management Area. Public hunting is now allowed, but most of the area is off-limits to motor vehicles, which tempers the effect.

In spite of the change in ownership and management, elk continue to move to this off-Forest area and recent population trends in HD 215 still hold. In response, the Fish and Game Commission increased the number of B-licenses for cow elk in this district in from 150 in 2008 to 200 in 2011 and 400 in 2012. Nonetheless the upward population trend continues. At the same time, mature bull numbers remain very low and, in spite of the burgeoning cow population, calf numbers over the past three years have dropped to half of what had been the norm for over a decade.

Habitat Considerations and Status in the Project Area

Elk Summer Range

The Nature of Summer Range

From late spring through late summer, elk need secluded calving areas and summer habitat rich in nutritional forage. Prior to European settlement, these conditions were widespread across much of the landscape, and elk in Montana were commonly observed in the grasslands and river bottoms of the Great Plains year-round. However, due to habitat alteration in the valleys and on the prairies (most often from livestock and crop raising) and the extirpation of elk from areas of human settlement, most elk now find summer range in mountain grasslands, meadows, and coniferous forests, descending to ranges in the foothills and adjacent valleys only in winter (Skovlin et al. 2002).

Adult bulls usually make the move toward summer range in early spring, seeking out the patchy interface between emerging green-up and the snowline. Cows, yearlings, and spike bulls usually remain in wintering areas into mid spring and then slowly move upslope following spring green-up toward summer range at higher elevation. Calving occurs either on spring transitional range or on summer range, depending on how far advanced the green-up is from mid-May to early June in any given year. The ability of cow elk to maintain high quality nutrition leading up to the birth of calves in late May and early June is thus dependent on the character of transitional range as well as that of summer range.

Key habitat components for elk on summer range include a mix of hiding cover, open foraging areas (ideally, small enough so that no point is more than 600 feet from a forest edge), forested forage, and riparian sites (including some open water) (Thomas et al. 1979, p. 109-121). The same habitat characteristics apply to calving areas; but of particular importance are open water sources for lactating cows and low-level cover, such as logs, deciduous shrubs, conifer regeneration, for concealing calves (Ibid, p. 120). Research suggests that the quality of summer range—via its ability to contribute to late summer nutrition—may be the most important variable in determining annual variation of herd growth (Stewart et al. 2005; Cook 2002, p. 305; Cook et al. 1996).

As a general rule, the resources that elk need to thrive on summer range are well distributed across mid-high elevation habitats on National Forest lands across western and central Montana. The degree to which elk perceive these resources as “available” to them, however, is another matter. While natural factors, such as intense predation, may constrain elk use of certain habitats, it is human activity—particularly activity enabled by open roads and motor trails—that is the primary factor limiting habitat availability on elk summer range. The amount of habitat that elk are actually able to use on a regular basis has been described as “habitat effectiveness” (Christensen et al. 1993). This effectiveness begins with the natural capacity of the range to provide cover, forage, water, and special habitat features, and is then modified by the distribution and density open roads and trails, competition from domestic livestock, and vegetation patterns created by timber harvest.

Elk Summer Range in the Tenmile – South Helena Project Area

The Forest Plan Glossary defines big game summer range simply as “a range, usually at higher elevation, used by deer and elk during the summer...” (HFP, p. VI/16). Working maps of big game range in the Divide landscape prepared for the Helena Forest Plan (1981) do not delineate summer range as a whole. Given this deficiency, most Forest Plan big game analyses since the early 1980s have interpreted summer range as (1) all land inside Helena NF boundaries, regardless of elevation, or (2) all Helena NF lands not shown as winter range on the 1981 maps. Summer range under either of these interpretations is extensive, covering true higher elevation “summer ranges” as well as lower elevation “transitional ranges” used mostly in spring and fall.

In this analysis, summer range is described as follows:

- In discussing the ecology of elk summer range in the Tenmile – South Helena area, this analysis adheres to the more traditional view of summer range as higher elevation habitat where most of the elk are found during the “summer”—between the time calves are born (late May – early June) and the first big frosts begin to push elk out of many key summer habitats (generally in mid-late September).
- In determining compliance with Forest Plan big game standard 3, which requires maintaining 50% of summer range as hiding cover (HFP, p. II/17), summer range is considered the entire herd unit. This interpretation incorporates ground that serves primarily as transitional range and that is used only incidentally or occasionally in summer.

Most of the Tenmile – South Helena project area has functioned as elk summer range at one time or another. Exceptions are obvious non-habitat sites such as cliffs, talus slopes, very steep slopes, larger bodies of water, and certain areas severely altered by humans. Many high elevation areas are occupied by elk in summer year after year regardless of the weather regime, vegetation condition, or other ephemeral circumstances. Other areas are used in summer only under special conditions, such as extremely late snow melt, severe drought, elevated predation, or displacement by human activity.

In general, areas at lower elevation in the northern and southeastern portions of the project area serve primarily as transitional range. Over half of the project area has been classified as “winter range” [see the following section on “Winter Range”]. The degree to which the rest of the area is consistently occupied by elk during the summer depends on characteristics of local habitat. Areas of suitable habitat that focus elk activity during most summers are categorized as “key summer habitat” (for purposes of habitat effectiveness) or “important summer habitat” (for purposes of Forest Plan big game standard 7). These are the areas that contain the “key habitat components” discussed below.

The following sections discuss three approaches to assessing the quality of elk habitat on summer range and gauge the status of the Tenmile – South Helena project area with regard to each of them.

Forest Plan Big Game Standard 3: Hiding Cover on Summer Range

Analysis Approach

Forest Plan big game standard 3 employs hiding cover as the primary determinant of summer range capability. The standard specifies that hiding cover is to be maintained at or above 35 percent (measured by ground surveys) or 50 percent (measured as 40 percent crown closure) of the elk summer range within each herd unit (HFP, p. II/18). Big game standard 5 then adds the corollary that the minimum size for a block of hiding cover will be 40 acres in order to be tallied as “Forest Plan hiding cover.” Standard 3 also sets parameters for thermal cover, which has been identified as an important component of big game summer ranges. However, the standard applies the requirement only to winter range.

The use of hiding cover as a summer range standard is based on work summarized in Thomas (1979, p. 109-121, 130-133). Thomas recommended a ratio of 40 percent forested cover (20-30 percent hiding and 10-20 percent thermal cover) to 60 percent foraging areas (clearcuts, meadows, open forest) as an optimal mix of habitat structure on mid-elevation elk summer ranges in the Blue Mountains of Oregon. He felt that deviation from these ratios in either direction would lower habitat capability for elk. Thomas also presented an index of summer habitat effectiveness based on road density (p. 122-123) but did not attempt to combine it with the hiding cover/forage ratio.

Management guidelines for areas east of the Continental Divide in Montana have not relied on a single cover/forage ratio in evaluating summer range quality because of the variability in forest cover (30-70 percent) used by productive eastside elk populations [USDA and MFWP 1978, p. 2]. Lyon (cited in Leege, 1984, p. 10-11) concluded that habitat relationships in summer are far more complex than can be defined by cover/forage ratios, especially since elk habitat needs change drastically during that period (from calving and nursing through intense foraging to mating). These conclusions were based on field tests of cover/forage ratio guidelines which failed to improve predictions made by road density models alone.

Status of the Project Area and Other Local Management Units

Forest Plan big game standard 3 is relevant to the Tenmile – South Helena project area in that proposed project alternatives would remove some of the cover currently provided by standing dead trees. In areas not treated, hiding cover provided by beetle-killed pine trees will be gradually disappearing over the next decade as those trees come down of their own accord. In both cases, summer range suitability as measured by the amount of hiding cover will decrease. Table 79 shows that all three of the elk herd units that cover the Tenmile – South Helena project area currently retain more than 50 percent hiding cover (as measured by the MFWP method) and are thus in compliance with Forest Plan big game standard 3.

Table 79. Status of the three elk herd units that cover the Tenmile – South Helena project area as per Helena Forest Plan big game standard 3, which requires 50 percent MFWP hiding cover on summer range

Elk herd units	Percent of Forest Plan Hiding Cover on Summer Range	Complies with Forest Plan Big Game Standard 3?
Black Mountain – Brooklyn Bridge	57%	Yes

Elk herd units	Percent of Forest Plan Hiding Cover on Summer Range	Complies with Forest Plan Big Game Standard 3?
Jericho	73%	Yes
Quartz Creek	57%	Yes

Habitat Effectiveness

Analysis Approach

Habitat effectiveness (HE) is another broad measure of summer range quality in common use. Since the availability of basic habitat components tends to be satisfactory on most summer ranges, variations in habitat effectiveness are related most often to the opportunity to avoid human activity. Opportunity for seclusion—or the lack thereof—on the National Forest is primarily a function of open roads, which, if abundant enough, can shunt elk away from habitat sites that they would prefer to use. Habitat effectiveness is thus based on open road density (ORD) and provides a measure of the extent to which roads erode the availability of otherwise suitable habitat on elk summer range (Christensen et al. 1993). Open road density is translated to habitat effectiveness via a curve derived from Perry and Overly (1977) and the Montana Cooperative Elk-Logging Study (Lyon 1979). The latter study recommends minimum HE of 50 percent (= ORD of less than 2.0 mi/mi²) in summer range areas being managed specifically for elk. Habitat effectiveness is not a Forest Plan standard.

A problem with habitat effectiveness as an index of habitat functionality is that it measures open road density over broad areas (typically, elk herd units) without considering how roads are distributed. Roads that pass through key habitats (wet meadows, riparian areas, nursery areas, aspen stands, etc.) degrade the capability of elk summer range to a greater extent than those that traverse areas of less importance. This kind of impact on localized and sometimes poorly mapped habitat features is difficult to quantify over an area as large as the Combination Area or even a herd unit. This is another reason to qualitatively look at local habitat components in the project area—to see how they are affected by roads and how proposed vegetation treatments may add to the effects.

Status of the Project Area and Other Local Management Units

Habitat effectiveness in the EHUs in the project area was calculated using an index developed by Lyon (1983) and employed by Christensen et al. (1993), who recommend habitat effectiveness levels of at least 50 percent on elk summer range as a whole and 70 percent in areas of key habitat (productive sites where elk consistently concentrate). While open road density for each elk herd unit can be measured via the Forest road database, the same information is not available for “key summer habitat”. Key habitat has not been delineated, although the accounting of local summer habitat components in the next section and the tally of important wetland and riparian sites in a following section gives some sense as to the distribution and integrity of key habitat. Habitat effectiveness for local herd units is shown in Table 80.

Table 80. Habitat effectiveness (HE) on elk summer range in the two herd units overlapping the Tenmile – South Helena project area.

Elk herd units	Elk Herd Unit Square Miles	Miles of Open Roads during the Summer	Open Road Density (mi/mi ²) on Summer Range	% Habitat Effectiveness
Black Mountain – Brooklyn Bridge	84	69	0.82	65%
Jericho	55	70	1.27	56%
Quartz	57	63	1.11	58%

Local Summer Habitat Components

Analysis Approach

While area-wide indices such as habitat effectiveness and percent hiding cover can provide a general sense as to the adequacy of elk summer range, a more site-specific examination of local sites and habitat features is needed to determine how a particular range functions and what effect management activity may have on its integrity. The results of numerous studies of elk summer range are discussed by Skovlin et al. (2002, p. 535-548), and serve as the basis for this analysis. This is supplemented with recommendations from the Montana Cooperative Elk-Logging Study (Lyon et al. 1985, p. 1-13), which have been incorporated into the Forest Plan as Big Game standard 6 (and are displayed in detail in HFP Appendix C). Based on these summaries, important components of elk summer range are (1) widespread moist sites, (2) summer thermal cover (provided by mature forest), (3) habitat diversity (vigorous juxtaposition of vegetation types, abundant ecotone), (4) strategically located hiding cover, and (5) areas away from human activity. In addition to these general components, elk behavior on summer range also generates a need for calving areas, timbered travel lanes, and wallows. Calving sites are addressed in a separate section below. Travel corridors and wetland habitats (where wallows are established) are discussed as separate topics elsewhere in the report.

Key Habitat Components in the Project Area

These habitat elements can be surveyed and evaluated on a local basis—as in a small project area or treatment unit—but they are difficult to assess in detail over broader areas, such as elk herd units or, in this case, the 61,395 acre Tenmile – South Helena project area. In this case, all important summer habitat sites that might be directly affected by proposed project units have been reviewed including areas surrounding treatment units and transportation routes. Fieldwork throughout the project area has revealed the location and status of most of the important summer habitat areas as they relate to alternative proposals. Furthermore, mapped wetlands of all types have been identified as important for elk summer habitat and project design criteria at and near these locations are intended to buffer and retain these important features on the landscape.

Calving Areas

Assessment

While elk calving areas are associated with summer range, they also occur on transitional range along routes where cows are moving between wintering and summering areas. All

of the key attributes of elk summer range summarized above are also important to successful calving and nursery areas. But, in addition, an abundance of effective low-level cover—deadfall, thickets of regenerating conifers, dense shrub growth (sagebrush being frequently used)—is key to hiding calves from predators and humans.

The Helena Forest Plan addresses elk calving areas by restricting motorized use in known calving and nursery areas during peak use: late May–mid June for calving, late June–late July for nursing. The problem has been that many calving areas are difficult to pinpoint, varying from year to year depending on snow-melt and the progress of spring green-up. Likewise, nursery areas are rather mobile, moving with the herd, and they may encompass broad, amorphous areas. In general, almost any area where groups of cow elk are observed between mid-May and late July can be considered to be serving as a calving or nursery area. And, like much of summer range, these sites are not well mapped.

Status of the Project Area and Other Local Management Units

Calving and nursery areas are widely dispersed across the project area but they occur most frequently at higher elevations often at or near the heads of drainages where human interference is unlikely. Such sites provide good forested cover, access to water, high-quality forage, and, often, separation from regular human activity. The Continental Divide ridge and the heads of drainages that originate there provide a good example of the kinds of areas cow elk use for concealing and nursing young calves. In particular, the ridge north of Jericho Mountain and west of the Continental Divide (Jericho EHU, but west of the project area) is broad, thickly forested, unroaded, and flanked by numerous springs and seeps at the heads of streams flowing off east and west. Forested forage is available and open parks scattered off the ridge provide more robust foraging opportunities for the cows. Other important calving and nursery areas include the Lazyman Gulch roadless area (Black Mountain – Brooklyn Bridge EHU), and Roe and Morgan Gulches south of the project area (Quartz Creek EHU).

Winter Range

The Nature of Winter Range

Traditionally, the availability of suitable winter range has been seen as the key limiting factor for most elk populations (see Polfus 2011, p. 20-23; Lyon and Christensen 2002, p. 559). Winter ranges are usually smaller than summer ranges, supply less forage, provide less forest cover, often lie closer to sources of human disturbance, are often grazed over by domestic livestock, and are occupied by elk when temperatures are low and snow may limit access to forage. Under these conditions, elk catabolize fat and muscle and may lose 25 percent or more of their body weight in severe winters and 10 percent in moderate to normal winters (Cook 2002, pp. 305-310). Managing for wintering areas with minimal human activity and adequate forage can help reduce energy costs associated with over-winter survival (Skovlin et al. 2002). On the other hand, recent studies suggest that while natural mortality is generally higher on winter ranges, the probability of elk surviving a given winter is directly linked to the quality of nutrition on spring, summer, and fall ranges (Cook 2002, p. 305).

In the Divide landscape, as well as across much of the Helena NF, a large proportion of elk winter range lies on private land—or other non-Forest lands—in lower elevation

foothills and valleys. Big game habitat on these lands is outside the jurisdiction and control of the National Forest. Elk winter range for both Forest and not-Forest lands has been delineated on broadscale maps by MFWP [MFWP 2011a, 2011b].

Managing Winter Range: Cover, Forage, and Energy Balance

Helena Forest Plan standards for elk winter range focus on two things: (1) providing adequate thermal cover (stands of trees greater than or equal to 40 feet high with at least 70 percent canopy closure) and (2) restricting disturbance from motor vehicles. Thermal cover in stands larger than 15 acres needs to account for at least 25 percent of winter range in each elk herd unit, and vehicle traffic through elk wintering areas is to be restricted to those few primary roads and snowmobile trails needed to access other parts of the Forest. The Plan does not address forage on winter range.

For several decades, thermal cover has been one of two pivotal habitat elements at issue on big game winter ranges (forage being the other). In winter, thermal cover stands curtail snow accumulation, block wind, and, under the right conditions, moderate temperature under the canopy. However, the value of thermal cover—widely accepted as a key component of elk winter range in the 1970s and 1980s (Thomas 1979; Beall 1976)—has been called into question by more recent research (Skovlin et al. 2002). A review of experimental tests aimed at probing the value of thermal cover to big game animals (Cook et al. 2005) concluded that the thermal cover benefit attributed to dense forest structure was probably not operative across a considerable range of climate, including most elk winter ranges in Montana.

Recently, Thompson and others (2005) have made a case for the importance of forest cover on Montana elk winter ranges. They argue that elk benefit from solar radiation in open habitats only as long as forage is adequate and accessible—the norm in most winters. But when forage is scant or buried by deep or crusty snow, elk use up stored energy reserves at a higher rate, and the metabolic cost of remaining in open grassland or shrubland becomes too high. In those cases, elk switch to an energy conservation strategy, moving to forest cover, becoming less active, and subsisting on low quality forest forage.

The forest formation advocated by Thompson et al. (2005) is not the classic continuum of greater than or equal to 70 percent canopy closure, but rather, a cover/forage mosaic where patches of dense cover are intertwined with more open-canopied forest and small openings. This provides an environment with manageable snow conditions and useful forage [deciduous shrubs, elk sedge, young conifers (esp. Douglas-fir), and arboreal lichens—species that thrive in more open forest conditions]. Thompson et al. (2005) provides no shorthand descriptive term for this habitat formation; but it is not “thermal cover.” Field monitoring by MFWP biologists has shown that even when elk spend daylight hours foraging in open grasslands, they most often retreat to these kinds of mature forest stands to bed down at night (T. Carlsen, A. Grove: personal communication 2012 with Brent Costain, Helena NF wildlife biologist).

Timber harvest or other overstory modification in thermal cover will inevitably lead to a loss of overstory density and of thermal function. On the other hand, carefully planned selective harvest in mature stands that creates the mix of forest structure described by

Thompson et al. (2005) may improve the suitability of such stands as winter cover for elk.

Project Area Winter Range

Much of the Tenmile – South Helena project area consists of elk summer range and spring/fall transitional range. Winter range is also mapped across a large portion of the project area (Figure 58). However, based on elk locations and routes flown during winter counts by MFWP, functional winter range is found in the extreme northern edge and the near the eastern project boundary along the foothills.

Most of the project area is not typically used by elk in winter. Rather, it serves as transitional range for animals moving toward summer range in spring and back toward wintering areas in the fall. For example, near Tenmile Creek at US 12, stands adjacent to winter foraging meadows are almost pure Douglas-fir and still green, but on the ridgetops lodgepole pine is mixed in and the overstory is beginning to open up due to the loss of live canopy. In its current state, very little of this lodgepole pine forest exhibits canopy closure dense enough to qualify as Forest Plan thermal cover. However, these stands do provide the kind of habitat to which elk will retreat during severe winter conditions or where they bed down at night after foraging in nearby private grasslands. Except in extremely mild, low-snow winters, however, elk do not begin moving into these forests until late April or early May when winter conditions have abated—thus the more accurate characterization is “transitional range”. Primary elk winter range is located on private and state lands to the north along US 12 and east near I-15. Table 81 summarizes the thermal cover on winter range in the three herd units within which the project occurs.

Table 81. Acres and percent of thermal cover on elk winter range by herd unit

Elk Herd Unit	Winter Range Acres	Thermal Cover on Winter Range Acres	Percent Thermal Cover on Winter Range
Black Mountain – Brooklyn Bridge	53,444	9,320	17%
Jericho	17,419	4,272	25%
Quartz Creek	29,603	4,789	16%

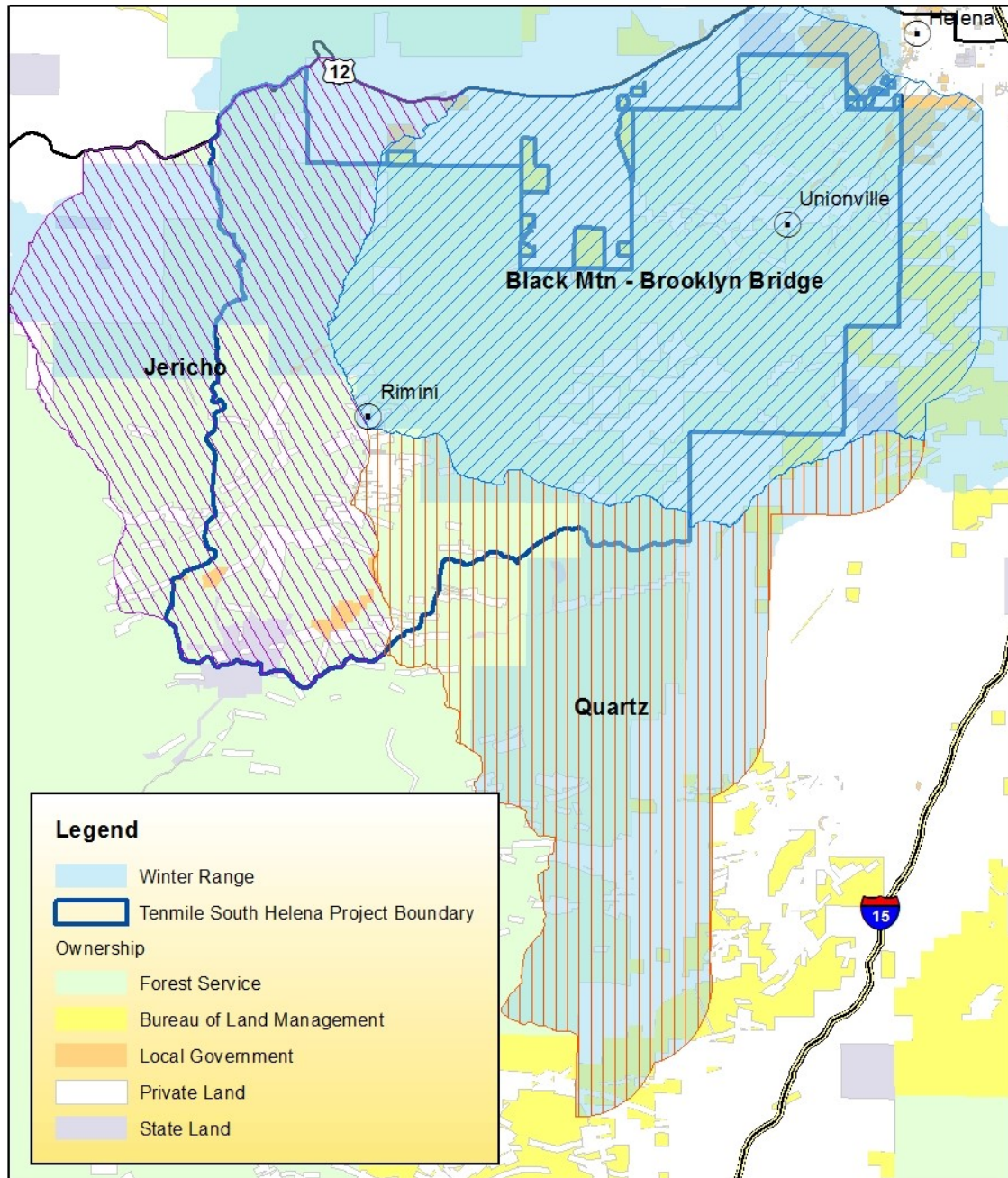


Figure 58. Elk winter range in the Tenmile – South Helena project

Fall Range and the Hunting Season

Elk Management in the Hunting Season

The current elk hunting season in Montana runs for a total of 12 weeks, with the bow season beginning around the first of September and the rifle season around the 3rd week in October. Elk management during this period focuses on maintaining population numbers well above viability thresholds, protecting selected sex and age classes from over-harvest, providing public hunting opportunity, and attempting to balance elk distribution across public and private lands. While these functions are primarily a responsibility of Montana Fish, Wildlife and Parks (MFWP), the Helena NF works to

complement their efforts by managing elk habitat on the National Forest. The goal has been to provide security habitat that allows a reasonable number of elk to escape hunters so that MFWP does not have to reduce the allowable harvest or shorten the hunting season (USDA 1986). On the other hand, the Forest needs to provide enough access via roads and trails so that hunters have a fair opportunity for success—thus preventing excessive numbers of elk from amassing on private ranchland during the winter.

Each year, MFWP reviews bag limits and other regulations for each hunting district and makes adjustments, as needed, based on the results of hunter surveys, check station counts, and winter range aerial censuses. In most parts of the state, regulation emphasizes maintaining a robust reproductive segment of the population by limiting the number of hunting permits for cows. With no limit on the number of adult bulls that can be taken in most hunting districts covering the Helena NF (HD 380 in the Elkhorn Range being an exception), MFWP depends on the Forest Service to provide habitat security on the National Forest to protect enough bulls to meet objectives [typically more than 10 bulls/100 cows].

Elk Vulnerability and Security

Elk security has been defined as “the protection inherent in any situation that allows elk to remain in a defined area despite an increase in stress or disturbance associated with the hunting season or other human activities” (Lyon and Christensen 1992). Elk vulnerability is the reverse of security. This analysis focuses on security during the hunting season, when the primary issue is more one of hunter access and less one of displacement of elk from preferred habitat—which is a key issue on summer range.

In the Divide landscape (as on much of the Helena NF), elk security/vulnerability during the hunting season can be a primary determinant of elk abundance and population structure. While the ability of elk to survive the hunting season is influenced by a number of environmental circumstances, analysis and management strategies in recent decades have focused on two factors: roads and hiding cover.

Several studies have documented the effect of roads on elk security, population structure, and hunter success (Edge and Marcum 1991; Leptich and Zager 1991; Unsworth and Kuck 1991; Gratson and Whitman 2000). These have demonstrated that, except in aberrant circumstances, open roads influence elk distribution during the hunting season and targeted road closures can lower the kill rate in a given area. Increasingly, displacement of elk from roaded public land into more remote terrain or to off-limits private land early in the fall can depress hunter success rate throughout the remainder of the season.

The precise role of hiding cover is more elusive. Some studies and analysis methodologies have emphasized cover as a primary factor for elk in the fall and have attempted to quantify its contribution to security—as a counterweight to open road density (Lyon 1979; Perry and Overly 1976). A majority of management approaches, however, while recognizing that cover is often important in allowing elk to elude hunters, have concluded that the influence of cover can be overwhelmed by a surplus of open roads and the hunting pressure that they facilitate (Christensen et al. 1993; Henderson et

al. 1993, p. 111; Lyon and Christensen 1992; Lyon and Canfield 1991; Thomas 1979, p. 104-105) (see also the discussion in Skovlin et al. 2002, p.550-554).

The abundance and distribution of effective hiding cover needs to be examined more carefully in the more open elk ranges east of the Continental Divide (as on much of the Helena NF) and may be taken more for granted in the dense forest environments of western Montana and northern Idaho (Hillis et al. 1991). Managing for key blocks of cover that field observation demonstrates are important to hunted elk is probably a more effective strategy than attempting to maintain a specified minimum acreage of hiding cover within a herd unit without examining how it is distributed and used by elk.

Another factor contributing to elk security is land ownership pattern, i.e. the checkerboard ownership of public and private land. In recent years, more elk have been finding fall refuge on large blocks of private land off the National Forest. This occurs when ranchers or other owners of large parcels near the Forest prohibit or restrict public hunting. In parts of the Divide landscape, elk have been quick to utilize the security value of these private lands. Some recent studies in Montana have concluded that, given the choice, many elk prefer unhunted sanctuaries on private land to traditional security areas on public land (Proffitt et al. 2013; MFWP 2011c). Proffitt's study found that cow elk, in particular, are drawn to private land refuges, while most mature bulls tend to rely on traditional security areas on the National Forest. The impetus to move to private land prior to or early in the hunting season may be driven by inadequate security and/or an overabundance of hunters and motorized recreationists on public lands. Later in the season it may be generated by accumulating snow and scarce forage. Or, it may be that elk are naturally drawn to valley and bottomland habitats that, prior to the arrival of Eastern settlers, represented the core of their traditional range. Whatever the reason, these private sanctuaries are acting as valleyland and foothills "security areas" that augment traditional security provided by unroaded areas on public land.

Hiding Cover/Open Road Densities

Analysis Approach

The current Helena Forest Plan standard for measuring elk security/vulnerability during the hunting season [big game standard 4a (HFP, p. II/17 – II/18)] uses an index that combines open road density and hiding cover. Forest roads are calculated at 100 percent of their length, private roads at 25 percent. Hiding cover is derived from canopy cover (using the MFWP definition) via a Forest Plan formula (HFP, top of page II/18). Cover needs to occur in stands at least 40 acres in size to qualify as "Forest Plan hiding cover". Compliance is determined via the graph in Figure 59, which has been drawn using the points in the table at the top of Forest Plan page II/18.

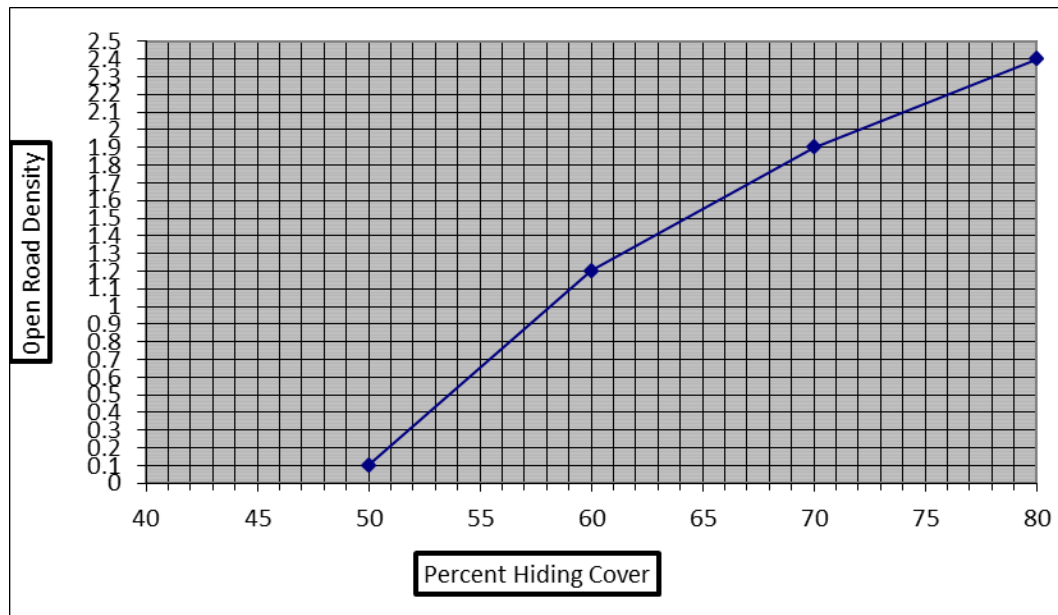


Figure 59. Graph derived from MFWP hiding cover (crown closure) and open road density points used to measure compliance with Forest Plan big game standard 4a. Points below the curve are in compliance with the standard; points above the curve are out of compliance.

This measure of elk vulnerability during the hunting season was derived from research and habitat models devised in the 1970s and early 1980s that were originally designed to measure habitat effectiveness for elk on summer range in western Montana—particularly in areas where timber sales were methodically subtracting forested cover and unroaded habitat (Lyon 1979). Nonetheless, it has been employed as an index of elk hunting season security in a number of Forest Plans in Region 1.

Status of Local Elk Herd Units

As can be seen in Figure 57, the Tenmile – South Helena project area includes portions of three elk herd units: the eastern half of the Jericho Mountain EHU, most of the Black Mountain- Brooklyn Bridge EHU, and roughly the northern sixth of the Quartz Creek EHU. These herd units have been described in the previous section “Helena NF Habitat Management: Elk Herd Units”. Table 82 displays current levels of Forest Plan hiding cover (in blocks >40 acres), open road density during the general hunting season (October 15 – December 1), and compliance with Forest Plan big game standard 4a.

Table 82. Current hiding cover and open road density on fall elk range. These conditions are likely to remain relatively stable for the next four to five years. After that, stands will begin to drop out of hiding cover status, so that eventually both herd units will be far out of compliance with HNF standard 4a.

Attribute	Elk Herd Unit		
	Black Mountain-Brooklyn Bridge EHU	Jericho Mountain EHU	Quartz Creek EHU
Elk Herd Unit Square Miles	84	55	57
Weighted Open Road Miles (mi) in hunting season	69	70	63
Open Road Density (mi/mi ²) in Hunting Season	0.8	1.3	1.1
Total Acres in the EHU	53,840	35,345	36,733
Acres of <i>Forest Plan</i> Hiding Cover	30,608	25,810	20,849
Percent <i>Forest Plan</i> Hiding Cover	57%	73%	57%
Does the result comply with standard 4a?	Yes	Yes	No

Table 82 shows that the Black Mountain - Brooklyn Bridge and Jericho EHUs comply with Forest Plan big game standard 4a, and the Quartz Creek EHU does not. This can be verified by plotting open road density against percent hiding cover on the graph in Figure 59.

Hiding Cover in the Project Area

Open road density and percent hiding cover in the project area have not been calculated at the project level because, for purposes of determining Forest Plan compliance, the herd unit serves as the analysis scale. However, the general character and distribution of cover within the project area and how elk make use of it locally are described below.

Shrubs and regenerating conifers are sparse in the understories of a majority of the forest stands in the project area—particularly in the “clean” understories of the ubiquitous lodgepole pine stands. As a result, when beetle-killed trees begin to come down in earnest, this cover will disappear. Currently, typical lodgepole stands support roughly 400 trees/acre, which generally allows clean sight distances of no more than 100 feet. Once half of these trees are on the ground—probably in another five to seven years—sight distances will extend out beyond 200 feet and the stand will no longer qualify as hiding cover. Given the current absence of regeneration in stands such as this, hiding cover from new trees, which should begin appearing once the canopy opens up, is unlikely to be available on this site for another 30-40 years.

Stands of sapling conifers up 4.9 inches in diameter in old cutting units, however, will remain intact and serve as a primary source of hiding cover over the next several decades. These stands currently occupy about one percent of the project area.

Elk Security Areas

Analysis Approach

An alternative way of assessing elk security/vulnerability is to look at the size and distribution of elk security areas in a given herd unit or group of units. The basic methodology was developed by Hillis and others (1991) and has been in general use in the northern Rockies for over 20 years. Hillis et al. defined an elk security area as a block of non-linear, mostly forested habitat at least 250 acres in size with all boundaries at least ½ mile from open roads. The Helena NF has modified this approach for more open east-side Forest habitats: in the Divide landscape, minimum size for a bona fide elk security area is now 1,000 acres [based on discussions between MFWP and the Helena NF, 2013-2014]. These are areas large enough and generally diverse enough (in terms of cover, forage, and terrain) to hold elk throughout the hunting season. Smaller non-motorized areas (250-1,000 acres), while unlikely to provide long-term security, are recognized as useful intermittent refuge areas for elk attempting to elude hunters—and in parts of the Divide landscape they are the only “security” enclaves available. Therefore it’s important to preserve the integrity of the smaller intermittent refuge areas; but in determining percent security in a given elk herd unit, total acreages only of the security areas larger than 1000 acres are included.

Under this system, the first objective is to maintain as much of each elk herd unit as possible in security areas with a goal of 50 percent. The ultimate objective is to provide enough secure habitat that under all but extraordinary circumstances, Montana Elk Plan objectives and Helena Forest Plan objectives will be met. Thus, if MFWP population objectives are being consistently met within the surrounding hunting district—or that portion of the hunting district subject to influence by the elk herd unit in question—then the existing security level, regardless of the percentage, is probably adequate. In some cases, failure to meet MFWP population objectives may be due to factors other than habitat, such as intense predation or severe weather. Occasionally, it is also a function of poor viewing conditions or timing of aerial surveys that frustrate the ability of MFWP biologists to get accurate population counts.

Security areas are delineated for the portions of elk herd units that lie within Helena NF administrative boundaries, including non-Forest inholdings, on elk “fall” (or “hunting season”) range. In the case of the Divide landscape, it is assumed that all of a given elk herd unit—or at least that portion of it on the Forest—could potentially serve as elk fall range under one set of circumstances or another. So, the portion of the elk herd unit within the administrative boundary of Helena NF is used to determine security.

Elk Security in the Project Area and Surrounding Herd Units

Figure 60 shows the distribution of elk security areas and intermittent refuges in the Black Mountain – Brooklyn Bridge, Jericho, and Quartz Creek EHUs, including the Tenmile – South Helena project area. Altogether, the three herd units support two security areas (3,435 in the Jericho EHU and 5,781 acres in the Black Mountain – Brooklyn Bridge EHU) and six smaller intermittent refuge areas, ranging from 347 to 923 acres. The Black Mountain – Brooklyn Bridge EHU includes one full-sized security area and three smaller intermittent refuge areas, as can be seen in Figure 60 and in Table 83

(below). Security areas occupy 16 percent of the Black Mountain – Brooklyn Bridge EHU, 12 percent of the Jericho EHU, and none in the Quartz Creek EHU. The bulk of the security areas in the Black Mountain – Brooklyn Bridge and Jericho EHUs are in the Lazyman Gulch and Jericho Mountain roadless areas, respectively.

The intermittent refuges within the administrative boundary occupy 5 percent of the Black Mountain – Brooklyn Bridge EHU, 3 percent of the Jericho EHU, and 5 percent of the Quartz Creek EHU.

There is a total of about 7.2 miles of roads that are closed yearlong in elk security areas, and another 3.1 miles in security areas that are closed only during the hunting season. Given the size of the two security areas, the presence of these closed roads is not expected to compromise security. When considering all hunting season road closures, including the Continental Divide National Scenic Trail, 10.3 miles are closed to use in security areas, and 16.5 miles when the intermittent refuges are included.

Currently, elk security measured in this way is not a Forest Plan standard. It is merely a supplementary measure that helps us gauge elk security/vulnerability in these herd units.

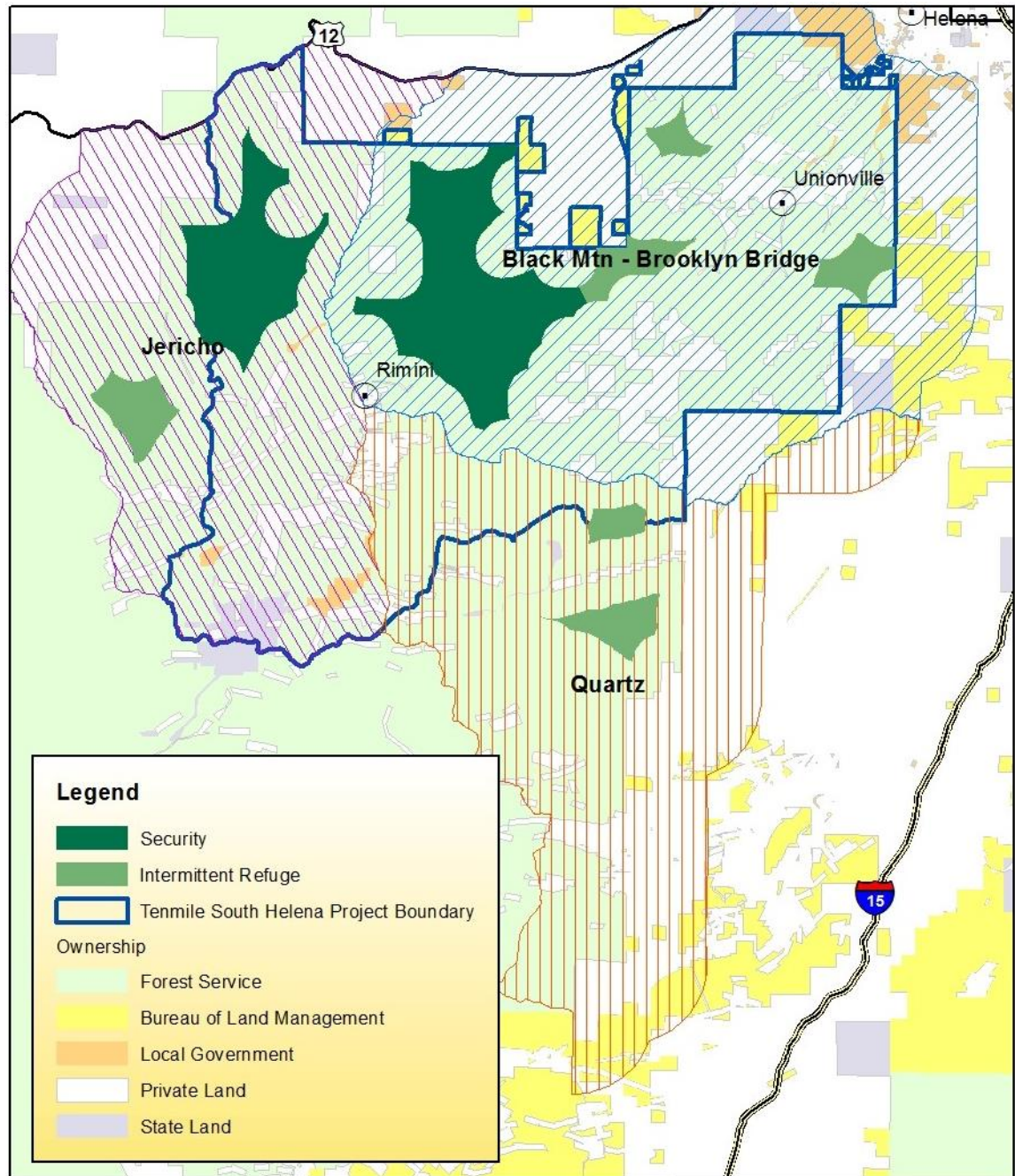


Figure 60. Fall Elk Security Areas in the Black Mountain – Brooklyn Bridge, Jericho, and Quartz EHUs and the Tenmile – South Helena project area.

Table 83. Percent of elk security and intermittent refuge areas in the Black Mountain – Brooklyn Bridge, Jericho, and Quartz Creek EHUs – within the Helena NF administrative boundary.

Attribute	Elk Herd Unit		
	Black Mountain-Brooklyn Bridge EHU	Jericho Mountain EHU	Quartz Creek EHU
Total Acres within HLCNF administrative boundaries	35,874	29,364	23,036
Acres in Elk Security Areas	5,781	3,435	0
Percent of the elk herd units in security areas, within the administrative boundary	16%	12%	0%
Acres in Intermittent Refuges	1,738	923	1,124
Percent of the elk herd units in intermittent refuges, within the administrative boundary	5%	3%	5%

The Tenmile – South Helena Project boundary includes all of the largest security area (centered on Lazyman Gulch) and over half of the security area located around the Jericho Mountain roadless area. The project area also encompasses three intermittent refuges in the Black Mountain – Brooklyn Bridge EHU, and half of another located at the boundary of the Black Mountain – Brooklyn Bridge and Quartz Creek EHUs (see Figure 60 above).

About 14 percent (8,263 acres) of the project area falls within elk security areas and 3 percent (1,942 acres) in intermittent refuges. These figures suggest that a number of elk that summer in the project area probably move into security areas beyond project area boundaries during the hunting season or that they take advantage of smaller pockets of cover, rough terrain, and other sites in roaded country that allow them to elude hunters outside of security and intermittent refuge areas. If this is the case, it will become more difficult in the near future for these elk to remain in these non-security areas during future hunting seasons as beetle-killed trees fall and hiding cover diminishes.

The degree to which these security areas in the project area contribute to the hunting season mortality in HD 215 and HD 335 is unknown. It is likely that elk inhabiting these areas in summer perceive a larger portion of the southern Divide landscape to be part of their hunting season survival strategy. Elk may range widely in the fall, moving wherever necessary to achieve the best balance between security and foraging opportunity.

Therefore the combined security and intermittent refuge acreage for the three herd units shown in Table 83 - 13,001 (15 percent of total EHU within the HLCNF administrative boundary) - is probably a more realistic estimate of what is available to project area elk. This view is bolstered by the fact that elk populations in surrounding hunting districts remain at or above MFWP objectives.

The elk security situation in HD 215 and HD 335 is discussed in more detail in the previous section dealing with Montana FWP Population Management: Hunting Districts.

Comparing Security/Vulnerability Measures

Forest Plan big game standard 4a attempts to quantify both hiding cover and open road density and then merge them into a single number that can indicate the viability of an area to protect bull elk in the hunting season. This is a reasonable approach since (1) it is intuitively obvious to hunters and wildlife biologists that ducking into hiding cover is an effective means for elk to avoid being detected and shot and (2) research continues to find that low open road density correlates well with areas that bull elk choose to inhabit during the hunting season [see the recent study by Proffitt et al. 2013]. The problem has not been with the reality of hiding cover and open roads as key factors in elk security but rather with the numerical formulas that have been used to integrate them, the sensitivity of these formulas to what is going on in the elk population, and the thresholds used to trigger red flags for management.

While the relationship between open road density and hiding cover can be informative, it does not account for the spatial arrangement and size of unroaded patches, topography as a mediator of hunter access, the distribution of forage, and other factors that influence the ability of elk to survive the hunting season. Forest stands that do not meet the definition of hiding cover may prove to be secure areas for elk where local conditions of topography, remoteness, and environmental barriers impede hunter access. Conversely, blocks of hiding cover situated in roaded country may be highly insecure. Hiding cover has a role to play but it is not synonymous with security (Lyon and Canfield 1991; Unsworth and Kuck 1991; Lyon and Christensen 1992; Christensen et al. 1993).

The security area approach, while recognizing the role of hiding cover as a key component of elk security does not attempt to quantify it precisely. Instead, it emphasizes the size and distribution of unroaded areas large enough to dilute hunting pressure and allow elk enough varied habitat in which to elude hunters and carry on with daily life.

Elk Habitat and Population Trends

Habitat Status and Trend

Elk habitat patterns in the Tenmile – South Helena project area remained relatively stable since the 1960s (when accurate Forest records exist) and 2006, when the initial effects of the mountain pine beetle infestation became evident. Changes during that time were generated by small local projects and by gradual regeneration of older harvest units. Now, habitat in the project area and in surrounding elk herd units is in the midst of a dramatic transformation in the aftermath of the pine beetle outbreak, which has been ongoing for much the past decade. Dead trees dominate the overstories of lodgepole pine and ponderosa pine forests over tens of thousands of acres. Currently, enough standing dead trees remain to preserve hiding cover, screening cover, and forested forage throughout most of these stands, but over the next five to ten years this cover will decrease as trees fall. Most of the thermal value of these stands is already gone. For the next several years, forest cover will be provided by stands of Douglas-fir, subalpine fir, Engelmann spruce, aspen, and some stands of surviving ponderosa pine. Many stands of younger lodgepole pine, too small to have been attacked by the beetles, will continue to provide hiding and screening cover.

Although the basic habitat components on which elk depend will remain readily available on the landscape, their relative abundance, arrangement, and character will be shifting. For the next several years, hiding cover, thermal cover, screening cover, and forested forage will be less available. Open foraging areas, palatable forage in general, and calf concealment sites will become more widespread. Travel routes will shift because of the proliferation of stacked deadfall. Younger forest stands—particularly sapling lodgepole pine—will become more important as hiding cover. The juxtaposition of cover and foraging areas will be altered, as will the character of forested wetland sites. Edge and ecotone habitat will increase. The internal configuration of security areas will change as cover disappears, sight distances increase, internal foraging opportunities expand, and hunter access becomes complicated by coarse woody debris.

While these trends in habitat can be predicted in general, the specific ways in which they play out on the ground in the Tennile – South Helena project area and in local elk herd units is difficult to predict. Extensive survey work over the next decade will be needed in order for MFWP and the Helena NF to decipher the new patterns and adjust management schemes to the new reality of post-beetle elk range.

Population Status and Trend

The Status of Elk in the Helena NF Plan Area

In the early 1980's, the total elk population on the Helena National Forest was estimated at about 5,000 (4,900 elk in 1981) (HFP, p. V/5). The Helena Forest Plan (released in 1986) sought to improve this number by devising big game standards designed to provide enough habitat on the National Forest land to support 6,400 elk by 2000. This was in support of MFWP goals for harvestable elk (HFP, p. V/5). Currently, MFWP aerial survey data indicate that at least 11,349 elk inhabit hunting districts centered on the Helena National Forest, and that at least 14,736 elk inhabit all of the districts that overlap the Forest to some degree. Accounting for elk that spend most or part of their time on non-Forest land or on the Beaverhead-Deerlodge NF, the number of animals in these districts that make up the Helena NF population is still well in excess of 6,400.

The Status of Local Elk Hunting Districts

The status of hunting district (HD) 335, which encompasses the entire Tennile – South Helena area, and HD 215, which abuts it along its western border, are discussed in some detail in the previous section “Montana FWP Population Management: Hunting Districts.” Both of these hunting districts have been meeting or exceeding MFWP objectives for total elk numbers and bull/cow ratios for most of the past decade (See Table 77. Numbers of elk observed and bull/cow and calf/cow ratios during aerial winter range surveys in HD 335 compared to the Montana Elk Plan objectives. and Table 78). In HD 335, counts for the past 2 years have averaged 1,007 elk, which is well in excess of the district objective of 480 – 720 elk. Likewise, in HD 215, total elk counts over the past 2 years have averaged 2,364 animals—well above the district objective of 1,120 – 1,680 elk. Elk numbers continue to hold up, despite the deterioration of forest cover in pine stands across both hunting districts. The loss of hiding cover over the next decade may reveal something about the importance of this component to the maintenance of robust elk populations in these districts.

Effects of the Mountain Pine Beetle Outbreak

It seems unlikely that habitat changes generated by the mountain pine beetle outbreak will negatively impact elk productivity or those aspects of survivorship that are not related to human activity. The forage base will expand as forest canopy declines and ground vegetation increases, likely improving prospects for productivity. The opportunity to hide and protect calves should not be diminished by the loss of canopy cover, and in fact, should improve with the increase in deadfall, shrubs, and young conifers. So, there should be a relative decrease in predation loss to calves. Although forested hiding cover will be substantially less than it is now for the next 20-30 years, enough will remain for adaptable animals such as elk to adjust to the new patterns.

To the degree that survivorship during the hunting season is related to hiding cover in roaded areas, the potential for hunter success on public land should increase in the near future. Elk that remain in areas with an open road network during the hunting season are more dependent on local hiding cover than those that retreat into large security areas. Most elk, however, are dependent on security areas (on public and private land) to survive the hunting season. These areas will remain intact, since their effectiveness is primarily a function of open road distribution rather than of hiding cover. Decrease in hiding cover within these units will undoubtedly affect elk use patterns as they adapt to the new arrangement of cover, forage, and accumulated woody debris. This may be problematic in the smaller intermittent refuge areas (250 – 999 acres), but less so in the large, diverse security areas, such as in the Jericho Mountain and Lazyman Gulch Roadless Areas where habitat options abound. Distance from motorized routes, however, will remain the key factor allowing elk to survive the hunting season.

The ongoing loss of forest cover throughout local hunting districts may eventually require shifts in motorized access management by the Helena NF and changes in hunting regulation by MFWP. The combination of elk adaptability and the capacity of management agencies to quickly respond to observed changes in local elk populations will ensure the populations continue to meet Montana Elk Management Plan objectives for HDs 215 and 335.

Wildlife, Environmental Consequences

The following measures are evaluated to analyze effects to elk:

- Summer range Forest Plan standard 3 for hiding cover (p. II/17) and habitat effectiveness by Elk Herd Unit (EHU)
- Hiding cover/open road densities Forest Plan standard 4(a) by EHU (p. II/17)
- Hunting season elk security by Elk EHU
- Winter Range Forest Plan standard 3 for thermal cover by EHU (p. II/17) and Forest Plan standard 4(c) (p. II/18)

Desirable Habitat Conditions	
✓	Hiding Cover within each elk herd unit to meet FWP population objectives
✓	50% summer habitat effectiveness by elk herd unit
✓	Hiding cover/open road density to support an extended hunting season
✓	Adequate security habitat by elk

Effects Common to All Alternatives

Untreated portions of the project area will continue to progress through succession regardless of alternative. Disturbance processes including climate change, insects and diseases, and fire will continue to influence the project area. Insect infestations will continue to create snags. Large areas of untreated stands would remain on the landscape where natural snag creation and attrition processes would proceed unabated and would continue to shape elk habitat.

Effects Common to All Action Alternatives

Summer Range and Calving Areas

Summer range habitat effectiveness measures how much of a given area elk are likely to use during the non-hunting season. It is a function of suitable habitat components (cover, forage, wet sites, travel routes) and reduced human disturbance (generally measured in terms of open roads and motorized trails) (Christensen et al. 1993). Timber harvest and burning in all action alternatives would reduce cover in the short term while improving foraging capability in the short and long term. The increase in foraging habitat would improve habitat effectiveness to a greater degree than cover loss would diminish it; that is, in most areas proposed for treatment, quality forage is limited while screening cover provided by conifers, alive and dead, is abundant.

- Treatment effects generally fall into three categories:
 - Some of the regeneration harvest would remove trees currently providing hiding cover.
 - Intermediate harvest would remove live trees from within stands that currently provide hiding cover to the extent that hiding cover would no longer meet the Forest Plan definition.
 - Prescribed fire treatments would consume dead and dying trees currently providing cover. Conversely, prescribed fire would improve spring forage habitat in all action alternatives (Long et al. 2008a, Long et al. 2008b) which would benefit elk during calving and nursing periods due to increased nutritional demands associated with lactating.

All known elk calving and nursery areas would be protected during project implementation under all action alternatives.

Elk Security during Hunting Season

Timber harvest and prescribed fire in the action alternatives would remove conifers from stands that are currently providing elk hiding cover. This would potentially increase forage but would reduce tree density that currently provides hiding cover. Maintaining hiding cover in the project area is important to maintain big game habitat capability and hunting opportunity.

The action alternatives propose timber harvest and prescribed fire within existing elk security areas and intermittent refuge areas. Timber harvest or prescribed fire should not reduce the effectiveness of security areas given the distance of these areas from open roads, the irregularity of the terrain, and the value of additional fall forage within security areas. Timber harvest and prescribed fire could reduce the effectiveness of the

intermittent refuge areas due to their smaller size. However, removal of conifers would increase sightlines and diminish screening cover that is useful to animals during hunting season.

Winter Range

There is very little thermal cover on elk winter range and less in the Jericho and Quartz Creek EHUs than in the Black Mountain- Brooklyn Bridge EHU. Droughty, unproductive winter range sites aren't capable of growing the Forest Plan defined levels of crown closure needed to meet the thermal cover definition. Furthermore, the mountain pine beetle related tree mortality in the project area has reduced canopy cover below thresholds necessary to provide much thermal cover during the winter. Precommercial thinning in thermal cover on winter range could reduce some of the thermal cover effectiveness. Primary issues related to winter range include the disruption of wintering animals by human activity and potential increases in noxious weeds at the expense of native forage plants.

Alternative 1

Direct/Indirect Effects

Elk Summer Range

Hiding Cover

Alternative 1 will maintain the status quo with regards to Forest Plan standard 3 for at least another one to five years after which enough dead trees will have fallen to begin the erosion of cover throughout much the herd units. The Black Mountain – Brooklyn Bridge, Jericho, and Quartz Creek EHUs meet Big Game standard 3 (at least 50 percent hiding cover on summer range; see Table 84). Table 84 below compares the existing hiding cover condition and alternative 1, with that under alternatives 2 and 3.

Table 84. Percent of elk hiding cover on summer range by elk herd unit and alternative (Forest Plan standard 3).

Elk Herd Unit	Alternative 1/ Meets Forest Plan Standard	Alternative 2 / Meets Forest Plan Standard	Alternative 3/ Meets Forest Plan Standard
Black Mountain- Brooklyn Bridge EHU	56%/ Yes	37%/ Yes	41%/ Yes
Jericho Mountain EHU	73%/ Yes	53%/ Yes	62%/ Yes
Quartz Creek EHU	57%/ Yes	53%/ Yes	55%/ Yes
Note: alternatives 2 and 3 include the treatments on BLM administered units			

Field surveys in the project area indicate that a majority of the project area still provides hiding cover—most of it from standing tree trunks (Figure 61 and Appendix B of the Wildlife Report). Over the next decade, most of this cover will pass away as beetle-killed pine trees, which dominate the area, come down. After about 10 years, all three EHUs will support so little hiding cover that they may be unable to satisfy the requirements of standard 3. There is nothing that can be done to prevent inexorable natural processes from pushing the herd units out of compliance with the current Forest Plan hiding cover standard. Hiding cover—and compliance with the standard—will slowly return as regenerating conifers fill in over the subsequent decades, thereby again providing hiding cover.

Summer Habitat Effectiveness

Habitat effectiveness is a function of suitable habitat components (cover, forage, wet sites, and travel routes) and reduced human disturbance (generally measured in terms of open roads and motorized trails) (Christensen et al. 1993). It is not a Forest Plan standard. Because there would be no change in road access or vegetative treatments, habitat effectiveness would be unchanged in alternative 1. This level of habitat effectiveness as described under the existing condition and in Table 85 is above the recommended 50 percent threshold in each herd unit. Table 85 also includes the open road density and habitat effectiveness for the action alternatives.



Figure 61. Mature and pole-sized lodgepole pine - canopy >95% dead, with scattered regeneration (Douglas-fir and lodgepole pine) in Unit 108. Although the trees are mostly dead, they continue to provide functional hiding cover (i.e. ability to hide 90% of an elk at 200 feet) while standing.

Table 85. Open road densities (ORD) and elk habitat effectiveness (HE) on summer range by elk herd unit by alternative.

Elk Herd Unit	Alternative 1 ORD /% HE	Alternative 2		Alternative 3	
		During Implementation ORD/ %HE	Post Implementation ORD/ %HE	During Implementation ORD/ %HE	Post Implementation ORD/ %HE
Black Mountain-Brooklyn Bridge EHU	0.82/65%	1.14/56%	0.82/65%	1.05/58%	0.82/65%
Jericho Mountain EHU	1.27/56%	1.45/52%	1.27/56%	1.47/51%	1.27/56%
Quartz Creek EHU	1.11/58%	1.21/53%	1.11/58%	1.14/56%	1.11/58%

Local Summer Habitat Components and Calving Areas

In the past, the closed-canopied lodgepole pine forests that have dominated much of the project area provided effective summer thermal relief and sufficient hiding cover. The gentle/rolling terrain in much of the project area often makes for poor drainage and allows wet meadows, bogs, and other riparian and wetland sites to develop across a broad area, providing excellent summer forage. Some of the older forest stands both in and beyond the project area have accumulated sufficient deadfall to provide concealment for calves and bedding spots for adults.

Now that a large majority of the forest habitat in the project area is dominated by standing dead trees, the summer thermal function of these stands has mostly disappeared, or will shortly. The tree trunks still provide cover but over the next decade this component will fade away as with the downfall of the snags. As hiding cover declines, opportunities to conceal calves and to locate screened bedding sites will increase dramatically. None of this would affect the distribution of water across the area in any dramatic way, although the absence of mature tree cover might allow surface water to emerge at some sub-irrigated sites. This resource will remain relatively constant for lactating cows and for reliable forage production. Under alternative 1, these conditions will unfold in this manner across the entire project area. See also the following sections: Wetland Habitat and Riparian Zones, Habitat Fragmentation, Travel Corridors and Linkages, and Edges and Ecotones.

Elk Winter Range

The Black-Mountain-Brooklyn Bridge EHU is almost entirely mapped as winter range (99 percent); Quartz Creek EHU is 81 percent winter range; Jericho EHU is 49 percent winter range. The project area comprises 73 percent of winter range, all EHUs combined. Alternative 1 would not directly alter thermal cover; however, over time, thermal cover will decrease as expected where the mountain pine beetle mortality is concentrated as dead trees fall over the next several years. It will be several decades before those forested stands dying from mountain pine beetle are of a sufficient age to provide any canopy cover at all, let alone thermal cover. In areas where thermal cover is composed of Douglas-fir stands, cover would continue to be provided. However, over time, without disturbance these stands may become subject to stress-related mortality.

Elk Security During the Hunting Season

Hiding Cover/Open Road Densities

There are no direct effects to hiding cover or open road densities under alternative 1. The Black Mountain-Brooklyn Bridge and Jericho herd units currently meet standard 4a (Table 86); the Quartz Creek unit does not. Over time, the portions of the project area dominated by Douglas-fir stands will move through succession, become denser and closed-canopied, increasing susceptibility to wildfire, insects, and disease. Vertical structure will trend towards dense even-aged or uneven-aged conditions, conditions favorable for hiding cover. Conversely, as trees that have died as a result of the mountain pine beetle outbreak fall to the forest floor, the conditions that provided hiding cover will be lost until regenerating stands can again provide cover.

Table 86. Current hiding cover and open road density on fall elk range and effects of the action alternatives. These conditions are likely to remain relatively stable for the next four to five years. After that, stands will begin to drop out of hiding cover status, so that eventually both herd units will be far out of compliance with HNF standard 4a.

Alternative	Elk Herd Unit	Acres of Hiding Cover/Percent	Open Road Density Post-Implementation (During Implementation)	Meets Forest Plan Standard Post-Implementation (During Implementation)
Alternative 1	Black Mountain-Brooklyn Bridge EHU	30,608/57%	0.8	Yes
	Jericho Mountain EHU	25,810/73%	1.3	Yes
	Quartz Creek EHU	20,849/57%	1.1	No
Alternative 2	Black Mountain-Brooklyn Bridge EHU	19,902/37%	0.8 (1.14)	No (No)
	Jericho Mountain EHU	18,556/53%	1.3 (1.45)	No (No)
	Quartz Creek EHU	19,415/53%	1.1 (1.21)	No (No)
Alternative 3	Black Mountain-Brooklyn Bridge EHU	22,108/41%	0.82 (1.05)	No (No)
	Jericho Mountain EHU	21,786/62%	1.27 (1.47)	Yes (No)
	Quartz Creek EHU	20,061/55%	1.11 (1.14)	No (No)

Hunting Season Elk Security

Security habitat for elk is important during the hunting season relative to elk vulnerability, population structure, and hunter success. Under alternative 1, elk security would remain at its present level with security areas comprising about 16 percent, 12 percent, and 0 percent of the Black Mountain – Brooklyn Bridge, Jericho, and Quartz Creek EHUs, respectively (Table 87, which also includes the figures for the action alternatives). Further, there are about 4,833 and 3,139 acres of hiding cover within security blocks in the Black Mountain – Brooklyn Bridge and Jericho elk herd units, respectively, and none in the Quartz Creek EHU (because there are no security areas in Quartz Creek EHU). No new vegetation manipulation would occur in the project area under alternative 1, and shifts in hiding cover would be entirely a function of natural processes.

Table 87. Elk security area percent and acres of hiding cover remaining in security areas within the Helena NF portion of each elk herd unit by alternative.

Elk Herd Unit	Alternative 1 (percent security/acres hiding cover in security blocks)	Alternative 2 (percent security*/acres hiding cover in security blocks**)	Alternative 3 (percent security*/acres hiding cover in security blocks**)
Black Mountain- Brooklyn Bridge EHU	16%/4,833	16%/3,826	16%/3,996
Jericho Mountain EHU	12%/3,139	12%/1,498	12%/2,365
Quartz Creek EHU	0%/ 0	0%/ 0	0%/ 0
*The security percentages are for post-project implementation. Security percentages do not change between alternatives post-project implementation since security is not determined by the amount of hiding cover in a security area. **Remaining hiding cover has not been configured into 40 acre patch sizes. Therefore, the remaining hiding cover may not all satisfy the Forest Plan definition.			

Under alternative 1, as with elk security, intermittent refuge areas would remain at their present level comprising about 5 percent, 3 percent, and 5 percent of the Black Mountain – Brooklyn Bridge, Jericho, and Quartz Creek EHUs, respectively (Table 87, which also includes the figures for the action alternatives). Further, there are about 1,534, 863, and 981 acres of hiding cover within intermittent refuge areas in the Black Mountain – Brooklyn Bridge, Jericho, and Quartz Creek elk herd units, respectively. No new vegetation manipulation would occur in the project area under alternative 1, and shifts in hiding cover would be entirely a function of natural processes.

Table 88. Elk intermittent refuge area percent and acres of hiding cover remaining in intermittent refuge areas within the Helena NF portion of each elk herd unit by alternative.

Elk Herd Unit	Alternative 1 (percent intermittent refuge area/acres hiding cover in intermittent refuge areas)	Alternative 2 (percent intermittent refuge area*/acres hiding cover in intermittent refuge areas**)	Alternative 3 (percent intermittent refuge area*/acres hiding cover in intermittent refuge areas**)
Black Mountain – Brooklyn Bridge EHU	5%/1,534	5%/864	5%/1,239
Jericho Mountain EHU	3%/863	3%/863	3%/863
Quartz Creek EHU	5%/981	5%/907	5%/981
*The intermittent refuge area percentages are for post-project implementation. These percentages do not change between alternatives post-project implementation since intermittent refuge areas are not determined by the amount of hiding cover in an area. **Remaining hiding cover has not been configured into 40 acre patch sizes. Therefore, the remaining hiding cover may not all satisfy the Forest Plan definition.			

Alternative 1 would produce no new open roads (the main determinant of security and intermittent refuge area boundaries) and thus would have no immediate effect on the configuration or effectiveness of any elk security or intermittent refuge area.

No Action Alternative Cumulative Effects

While there can be no cumulative effect from no action being taken, a discussion of the likely trajectory of the elk habitat in the project area may prove beneficial.

With no action there would be no immediate change in elk hiding cover, thermal cover, or security areas. However, that is all very likely to be substantially different within a decade as standing dead trees and those soon to be dead will begin to rot at the base and fall over. The amount of thermal cover has been reduced in the last five years, and the hiding cover, while still sufficient because there are standing trees, will rapidly decrease as trees begin to fall. Elk security will technically not change with changes in vegetation only, but the lack of cover may increase hunter success with increased sight capability. Conversely, forage production should rapidly increase as a result of decreased overstory cover and increased water availability. Calving areas may be more secure with deadfall, even though movement through such areas may prove initially challenging. All of these changes are expected to continue as they currently exist through the indefinite future. The proposed action alternatives would impart changes to some of the area sooner than that which would occur naturally.

Alternatives 2 and 3

Direct/Indirect Effects

Elk Summer Range

Hiding Cover

Table 84 summarizes the effects to elk hiding cover on summer range. Alternative 2 would result in the reduction of 10,706 acres of Forest Plan hiding cover within the Black Mountain – Brooklyn Bridge herd unit, about 7,254 acres in the Jericho herd unit, and about 1,434 acres within the Quartz Creek herd unit (although not all of this is directly attributable to vegetation manipulation because changes in vegetation would reduce some of the polygon sizes to less than the threshold of 40 acres to qualify as hiding cover.) Alternative 3 would result in the reduction of 8,500 acres of hiding cover within the Black Mountain – Brooklyn Bridge herd unit, about 4,024 acres in the Jericho herd unit, and about 788 acres within the Quartz Creek herd unit. All herd units would meet Forest Plan standard 3 upon implementation of either action alternative (see Table 84).

Currently, about 76 percent and 70 percent of the treatment units in alternatives 2 and 3, respectively, still provide hiding cover—largely from standing tree trunks (see Figure 61).

Over the next decade, most of this cover will be reduced as beetle-killed pine trees, which dominate the area, fall to the ground. Hiding cover in treatment units will return slowly as regenerating conifers fill in over the next few decades.

Table 89 below displays the hiding cover treated under the action alternatives based on treatment type (prescription) and ownership in each of the three affected elk herd units. It is assumed that all treatments (except alternative 3 precommercial thin) will remove hiding cover. The effect is also graduated, with a more intensive reduction with the harvest treatments (regeneration, improvement, and shaded fuel break) to a lesser degree of change in the prescribed fire treatments, which are likely to burn in a mosaicked pattern with some areas unburned or very lightly burned.

Hiding cover will be reduced immediately upon treatment, again most extensively where trees are extracted and less so where stands are burned only or thinned. Forage use will depend in large part on distance from available cover habitat; elk use of forage habitat is generally located 300 to 500 feet from cover habitat and forested edges (Wisdom et al. 2005).

Low-severity burning would reduce down woody debris, some tree seedlings/saplings, and understory cover. There would be some overstory mortality, although this would be scattered and stands would likely continue to meet the Forest Plan definition of hiding cover.

Prescribed fire is routinely used to create or enhance elk habitat and has been shown to encourage early spring green-up, improve transition range, reduce conifer encroachment, increase palatability, and stimulate regeneration of aspen (Leege 1979 in USDA 2011b, Sachro et al. 2005, Hillis and Applegate 1998, Van Dyke and Darragh 2007, Long et al. 2008a, Long et al. 2008b, Canon et al. 1987). Forage would increase within a few years of treatment and would remain high for 10 to 12 years (USDA 2011b). Year-round forage species that would be expected to increase include shrubs such as *Ceanothus* (Crotteau et al. 2012), Rocky Mountain maple, and serviceberry (Lentile et al. 2007).

Burning in shrub and grasslands has also been shown to increase both production and nutritional quality that benefit elk (Van Dyke and Darragh 2007) and low-severity fire generally has the greatest benefit to elk when a mosaic of burned and unburned lands is available (USDA 2011b, Long et al. 2008a).

Units proposed for mixed-severity burning would experience a long-term reduction in overstory cover, although the response of the understory would vary over time. Grasses and forbs would become established within one to two years of treatment whereas shrubs and tree seedlings would become established within five years (Hirsh 2012, Collins et al. 2007, Crotteau et al. 2012). While there would be a stand level reduction in cover in fire-created openings, the interspersed of burned and unburned land would enhance landscape level habitat by providing a mosaic of forage and cover. For summer ranges, Thomas (1979) suggests openings from 10 to 40 acres are used by elk, whereas use is greatly reduced on larger openings. It is difficult to determine the size and spatial arrangement of openings created by mixed severity burning. Because cover would be retained in much of the burn units, it is expected that many of the openings created by mixed-severity burning would be within 300 to 500 feet of hiding cover and provide forage for elk within a few years of treatment (Wisdom et al. 2005).

Elk use of the landscape will change as elk seek out places where hiding cover remains after treatment. Alternative 2 would result in more changes to elk use of the landscape than alternative 3 due to more acres of hiding cover being treated, and area treated in general. Elk may be temporarily displaced during harvest and burning activities; however mitigation measures such as limiting harvest to a single drainage at a time are in place that will minimize that disturbance (See Mitigation/Design Elements).

Table 89. Acres of Forest Plan hiding cover treated, by treatment type and action alternative (based on R1-VMap).

Prescription		Black Mountain- Brooklyn Bridge EHU		Jericho Mountain EHU		Quartz Creek EHU	
		Alt. 2 acres	Alt. 3 acres	Alt. 2 acres	Alt. 3 acres	Alt. 2 acres	Alt. 3 acres
Regeneration Harvest	FS	915	285	2,133	1,824	753	228
	BLM	140	0	0	0	0	0
	Total	1,055	285	2,133	1,824	753	228
Improvement Harvest	FS	1,283	715	55	55	62	9
	BLM	361	0	0	0	0	0
	Total	1,664	715	55	55	62	9
Precommercial Thinning	FS	270	270	86	75	14	0
	BLM	0	0	0	0	0	0
	Total	270	270	86	75	14	0
Shaded Fuel Break	FS	284	292	998	754	0	0
	BLM	0	0	0	0	0	0
	Total	284	292	998	754	0	0
Private Land Buffer	FS	1,050	1,173	504	500	233	279
	BLM	0	9	0	0	0	0
	Total	1,050	1,182	504	500	233	279
Mixed Severity Prescribed Fire	FS	549	327	1,019	306	0	0
	BLM	0	0	0	0	0	0
	Total	549	327	1,019	306	0	0
Low Severity Prescribed Fire	FS	4,958	3,894	2,355	490	292	192
	BLM	129	621	0	0	0	0
	Total	5,087	4,515	2,355	490	292	192
Low Severity Grassland Prescribed Fire	FS	0	380	0	0	0	0
	BLM	0	0	0	0	0	0
	Total	0	380	0	0	0	0

Habitat Effectiveness

Alternative 2 would result in the construction of approximately 43 miles of temporary roads and in alternative 3, about 24 miles. These would be closed to the public and would be obliterated at project's end. About 56 miles of closed roads would be used as haul routes in alternative 2 (including the temporary roads), and 30 miles under alternative 3; these all would remain closed to public vehicle use. This use would undoubtedly displace any elk that would normally be making use of local habitat during the life of the project, but it would not influence open road habitat effectiveness as computed by Lyon (1983) and Leege (1984) because the roads remain categorized as closed. Even if included in the calculations, the change in open road density would affect the habitat effectiveness percentages by minor decreases (up to 9 percent during project implementation [see Table 85. Open road densities (ORD) and elk habitat effectiveness (HE) on summer range by elk herd unit by alternative.]. However, during project implementation and in the long term, habitat effectiveness in all three herd units will remain above 50 percent.

Project operations (cutting and skidding trees, hauling logs) are likely to redistribute elk on summer range, more so in alternative 2 than alternative 3. Mitigation measures will serve to minimize some of the impacts associated with project activities. For example, logging activities will be confined to a single drainage at a time, which will increase the probability of immediate return by displaced elk upon activity completion. Also, the temporary roads will be closed to the public which should reduce some of the displacement of elk.

Elk population parameters affected by summer range conditions (in particular total population numbers and calf/cow ratios) have steadily increased over the past 10 years in terms of population numbers and until 2012, calf/cow ratios generally remained in the range of 30-40 calves/100 cows year after year, above the objective for each measure. Calf numbers were down in 2012 and 2013, usually an indication of disruptive weather, poor adult nutrition, or heavy predation. Short term changes in habitat effectiveness during project implementation are not expected to influence population or calf/cow numbers since effects would be short-lived.

Local Summer Habitat Components and Calving Areas

Treatments proposed in alternatives 2 and 3 would remove dead trees that would otherwise fall and provide concealment for calves and bedding spots for adults, more so in alternative 2 than 3. However, because about 60 percent of the project area would remain untreated in alternative 2 and 70 percent in alternative 3, ample deadfall will be available across the project area to provide concealment and bedding spots, more so in alternative 3.

Neither action alternative will have a substantial impact on summer thermal habitat. A large majority of the forest habitat in the treatment units is dominated by standing dead trees; as such, the summer thermal function of these stands has mostly disappeared anyway. The removal of vegetation under either alternative should not affect the distribution of water across the area in any dramatic way, although the removal of mature tree cover might allow surface water to emerge at some sub-irrigated sites. Also, the

overlap of project activities with the elk calving period is typically limited due to wet conditions during the spring. Overall, this resource should remain relatively constant for lactating cows and for reliable forage production. To minimize the potential for project activities to displace elk from suitable birthing areas the following design feature is applied to all management activities:

If elk calving (late May through mid-June) or nursery areas (late June through July) are identified prior to or during project implementation, management activities will be delayed during active periods.

See also the following sections: Wetland Habitat and Riparian Zones, Habitat Fragmentation, Travel Corridors and Linkages, and Edges and Ecotones.

Elk Winter Range

Much of the project area is mapped as winter range. Table 90 and Table 91 summarize the acres affected on winter range, thermal cover on that winter range, and other thermal cover (outside of winter range) in all three herd units. It should be noted that although there is a somewhat substantial amount of mapped winter range in the herd units, most of the project is actually transitory range; elk winter at the lowest elevations near the project boundaries except in low snow years.

Alternative 2 treatments proposed on winter range in the project area include 15,010 acres in the Black Mountain – Brooklyn Bridge EHU, 3,909 acres in the Jericho EHU, and 680 acres in the Quartz Creek EHU. On winter range, all proposed treatments sum to 19,599 acres, which is about 20 percent of the winter range on the three herd units.

Alternative 3 treatments proposed on winter range in the project area include 12,863 acres in the Black Mountain – Brooklyn Bridge EHU, 1,380 acres in the Jericho EHU, and 196 acres in the Quartz Creek EHU. On winter range, all proposed treatments sum to 14,439 acres, which is about 14 percent of the winter range on the three herd units.

Winter range thermal cover is a subset of the winter range distribution. Alternative 2 would affect elk winter range thermal cover on 3,739 acres in the Black Mountain – Brooklyn Bridge EHU, 679 acres in the Jericho EHU, and 145 acres in the Quartz EHU. On winter range thermal cover, all proposed treatments sum to 4,564 acres, which is about 25 percent of the winter range thermal cover on the three herd units.

Alternative 3 would affect elk winter range thermal cover on 3,068 acres in the Black Mountain – Brooklyn Bridge EHU, 173 acres in the Jericho EHU, and 41 acres in the Quartz EHU. On winter range thermal cover, all proposed treatments sum to 3,823 acres, which is about 21 percent of the winter range thermal cover on the three herd units.

As in the above treatments, there is a gradient in intensity and effect to the thermal cover. Removal of trees in the regeneration harvest units would effectively reduce the cover to zero, with increasing cover retention in the less intensively harvested units. The mixed-severity prescribed fire will reduce cover, as well, but less so than the harvest treatments. The low-severity prescribed fire will reduce some cover, but much will remain in a mosaic in the treatment units. All treatments have been assumed to reduce all thermal cover with the exception of low severity prescribed fire.

Some temporary roads would be built in elk winter range; approximately 28 miles under Alternative 2 and 12 miles under alternative 3.

Several units are proposed for treatment during the winter in winter range in both action alternatives. These are:

- Alternative 2 - 7b, 7d, 8g, 8k, 8n, 8q, 9b, 39b, 39g, 39i, 39s, 40, 49c, 50, 56a, 56b, 58, 59a, 71, 73a, 73b, 73c, 73d, 73e, 75, 76, 78, 81, 84c, 85a, 85b, 89c, 94a, 94d, 94e, 94f, 94g, 100a, 100c, 101, 102a, 103a, 106b, 106d, 106f, 106h, 110a, 110b, 110c, 112, 114a, 114b, 116c, 116h, 116i, 121, 124a, 124b, 129a, and 138
- Alternative 3 - 50, 51, 58, 71, 73a, 73b, 73d, 75, 76, 78, 101, 114a, 114b, 121, 138, 175, and 180

Alternative 2 includes 3,729 acres of treatments in winter range during the winter. This is approximately 8 percent of the winter range in the project area (total winter range in the project area is 45,779). Alternative 3 includes 1,354 acres of treatment in winter range during the winter which is about 3% of the winter range in the project area.

Wintering elk historically have made use of open forest environments on winter range when snow conditions allow. The proposed treatments in thermal cover on winter range should create conditions that are attractive to wintering ungulates once project activities subside (as per Thompson et al. 2005).

Table 90. Summary of acres affected to winter range (WR), thermal cover on that winter range (WRTC), and other thermal cover (OTC) within the project area elk herd units, alternative 3.

Prescription		Black Mountain- Brooklyn Bridge EHU			Jericho Mountain EHU			Quartz Creek EHU		
		WR	WRTC	OTC	WR	WRTC	OTC	WR	WRTC	OTC
Regeneration Harvest	FS	970	138	0	180	47	243	406	23	98
	BLM	231	26	0	0	0	0	0	0	0
	Total	1,201	164	0	180	47	243	406	23	98
Improvement Harvest	FS	1,913	585	0	0	0	0	95	31	0
	BLM	416	153	0	0	0	0	0	0	0
	Total	2,329	738	0	0	0	0	95	31	0
Precommercial Thinning	FS	365	24	0	0	0	0	8	0	0
	BLM	0	0	0	0	0	0	0	0	0
	Total	365	24	0	0	0	0	8	0	0
Shaded Fuel Break	FS	307	83	0	963	92	7	0	0	0
	BLM	0	0	0	0	0	0	0	0	0
	Total	307	83	0	963	92	7	0	0	0
Private Land Buffer	FS	1,121	412	8	23	1	113	29	0	48
	BLM	0	0	0	0	0	0	0	0	0
	Total	1,121	412	8	23	1	113	0	0	48
Mixed Severity Prescribed Fire	FS	612	297	0	1,101	182	0	0	0	0
	BLM	0	0	0	0	0	0	0	0	0
	Total	612	297	0	1,101	182	0	0	0	0
Low Severity Prescribed Fire	FS	8,703	1,983	0	1,642	357	15	142	91	23
	BLM	372	40	0	0	0	0	0	0	0
	Total	9,075	2,023	0	1,642	357	15	142	91	23
Low Severity Grassland Prescribed Fire	FS	0	0	0	0	0	0	0	0	0
	BLM	0	0	0	0	0	0	0	0	0
	Total	0	0	0	0	0	0	0	0	0

Table 91. Summary of acres affected to winter range (WR), thermal cover on that winter range (WRTC), and other thermal cover (OTC) within the project area elk herd units, Alternative 3.

Prescription		Black Mountain- Brooklyn Bridge EHU			Jericho Mountain EHU			Quartz Creek EHU		
		WR	WRTC	OTC	WR	WRTC	OTC	WR	WRTC	OTC
Regeneration Harvest	FS	264	59	0	180	47	300	138	17	21
	BLM	0	0	0	0	0	0	0	0	0
	Total	264	59	0	180	47	300	138	17	21
Improvement Harvest	FS	1,318	248	0	0	0	0	0	0	0
	BLM	0	0	0	0	0	0	0	0	0
	Total	1,318	248	0	0	0	0	0	0	0
Precommercial Thinning	FS	365	24	0	0	0	0	0	0	0
	BLM	0	0	0	0	0	0	0	0	0
	Total	365	24	0	0	0	0	0	0	0
Shaded Fuel Break	FS	412	81	0	730	67	7	0	0	0
	BLM	0	0	0	0	0	0	0	0	0
	Total	412	81	0	730	67	7	0	0	0
Private Land Buffer	FS	1,246	509	8	23	1	98	58	24	54
	BLM	18	6	0	0	0	0	0	0	0
	Total	1,264	515	8	23	1	98	58	24	54
Mixed Severity Prescribed Fire	FS	342	107	0	219	16	0	0	0	0
	BLM	0	0	0	0	0	0	0	0	0
	Total	342	107	0	219	16	0	0	0	0
Low Severity Prescribed Fire	FS	6,236	1,631	0	228	42	13	0	0	23
	BLM	1,001	212	0	0	0	0	0	0	0
	Total	7,237	1,843	0	228	42	13	0	0	23
Low Severity Grassland Prescribed Fire	FS	1,662	191	0	0	0	0	0	0	0
	BLM	0	0	0	0	0	0	0	0	0
	Total	1,662	191	0	0	0	0	0	0	0

Fall Range and the Hunting Season

Hiding Cover/Open Road Densities

Under alternative 2, open road densities during the hunting season would remain constant. The newly constructed temporary roads (43 miles) and the closed roads to be used as haul routes (56 miles) would not be open to motorized use by hunters. These roads would receive “administrative use” by HLCNF personnel and equipment operators during the hunting season, which would temporarily perturb any elk or deer in the vicinity of the road, but it would not result in long-term displacement or put them more at risk from being shot. Unlike “habitat effectiveness” which focuses solely on the extent to which open roads displace elk from otherwise suitable habitat on summer range, the open road density component of standard 4a also measures the potential for hunters to probe into fall elk habitat and kill elk. If the 56 miles of closed and temporary roads were added to the open road mileage for the three project herd units, open road density in each herd unit would increase to 1.14 mi/mi² in the Black Mountain- Brooklyn Bridge EHU, 1.45 mi/mi² in the Jericho EHU, and 1.21 mi/mi² in the Quartz Creek EHU (see Table 85). Whether it is included in the calculation or not, the impact on elk vulnerability would be minor as the increased density would range from one-tenth to one-third mile per square mile.

Alternative 2 would remove an estimated 10,706 acres of Forest Plan hiding cover from the Black Mountain - Brooklyn Bridge EHU; 7,254 acres from the Jericho EHU; and 1,434 acres from the Quartz Creek EHU. Hiding cover would decline in each EHU to below the standard 4a thresholds (see Table 86).

Open road densities during the hunting season would also remain constant under alternative 3. The newly constructed temporary roads (24 miles) and the closed roads to be used as haul routes (30 miles) would not be open to motorized use by hunters. If the 30 miles of closed road were added to the open road mileage for the three project herd units, open road density in each herd unit would increase to 1.05 mi/mi² in the Black Mountain- Brooklyn Bridge EHU, 1.47 mi/mi² in the Jericho EHU, and 1.14 mi/mi² in the Quartz Creek EHU (see Table 85). As in alternative 2, these would be minor increases in road density, in this case ranging from 160 feet to two-tenths of a mile per square mile.

Alternative 3 would remove an estimated 8,500 acres of hiding cover from the Black Mountain - Brooklyn Bridge EHU; 4,024 acres from the Jericho EHU; and 788 acres from the Quartz Creek EHU. The Jericho EHU would remain in compliance with standard 4a. The Black Mountain - Brooklyn Bridge and Quartz herd units would not.

Hunting Season Elk Security

Effects to elk security are summarized in Table 92 and Table 93. Effects to intermittent refuge areas are summarized in Table 90 and Table 91. Both alternatives include utilization of currently closed roads and construction of temporary roads in some security areas during the hunting season (September 1 through December 1). About two miles of temporary road would be built in security areas and four miles in intermittent refuges in alternative 2 (Black Mountain - Brooklyn Bridge and Quartz Creek EHUs). Less than a

half mile of closed road would be used as a haul route in security and about a half mile in intermittent refuge areas.

No temporary roads would be built in security or intermittent refuges in alternative 3. Nor would any of the closed roads be used for hauling. Although, closed roads used for hauling just outside of the security area in the Black Mountain-Brooklyn Bridge EHU do affect security percentages due to the half mile buffer around the closed roads used to calculate security.

Table 92. Changes to elk security and intermittent refuge areas during project implementation for the action alternatives.

Elk Herd Unit	Alternative 1		Alternative 2		Alternative 3	
	Percent Security	Percent Intermittent Refuge Area	Percent Security	Percent Intermittent Refuge Area	Percent Security	Percent Intermittent Refuge Area
Black Mountain-Brooklyn Bridge EHU	16%	5%	13%	3%	15%	5%
Jericho Mountain EHU	12%	3%	12%	3%	12%	3%
Quartz EHU	0%	5%	0%	3%	0%	5%

Treatments proposed in security and intermittent refuge areas would result in the reduction in hiding cover in each herd unit, including security areas under each alternative (see Table 87), mostly due prescribed fire. Temporary roads and haul routes would also affect security in the Black Mountain-Brooklyn Bridge EHU.

Elk are likely to be displaced from areas of management activity to more secure areas during project implementation. Confining project activities to only a single drainage at a time would reduce these impacts as well as prohibiting recreational use of firearms by anyone working within areas closed to the general public (See Mitigation/Design Elements).

Action Alternatives Cumulative Effects

Cumulative effects are the incremental impacts that the direct and indirect effects associated with the action alternatives have on elk habitat in the context of the myriad of other past, present, and future effects on elk habitat from unrelated activities. The cumulative effects analysis considers spatial and temporal boundaries, how past activities have contributed to the existing condition, and whether the ecosystem can accommodate additional effects. Table 93 summarizes the key items that are taken into consideration for the cumulative effects analysis for elk habitat. See also DEIS - Appendix C, Cumulative Effects, for more information.

Table 93. Cumulative effects considerations for elk habitat.

Parameter	Discussion
Spatial Boundary	The spatial boundary is expanded to the point at which elk habitat is no longer measurably affected. The elk herd unit satisfies this requirement because this is the scale at which the effects to elk habitat can be examined at the stand or treatment unit. This boundary also provides a sufficient landscape to assess pattern and structure in the context of larger processes.
Temporal Boundary	The temporal boundary ranges from the 1960s (due to a lack of earlier records in the FACTS database) to those future projects that are either listed in our SOPA or are planned or implemented on private land within the elk herd unit boundaries.
Past Activities and Existing Condition	The effects of past activities are reflected in the existing condition. Past activities shaped the age class, density, and species composition of the elk habitat that comprise the project area today. The existing condition, which incorporates the changes due to past activities, has been measured by remote sensing and field validation.
Activities Considered in Cumulative Effects	Past activities that are included in the cumulative effects analysis include timber harvest, fuels activities, private land timber harvest, livestock grazing, special use permits, the Forest-wide Roadside Hazard Tree Removal and Fuels Reduction Project, among others.
	Ongoing and future activities include the Red Mountain Flume/Chessman Reservoir project, Telegraph project, livestock grazing, noxious weed treatments, annual road maintenance, Divide Travel Plan, and private land timber harvest.
Measurement Indicators	Measurements include effects to elk hiding and thermal cover and open road densities.
Thresholds	Forest Plan standards provide thresholds applicable to hiding cover on summer range, thermal cover on winter range, and the relationship of hiding cover to open road densities during the hunting season.
Methods	Past, ongoing, and reasonably foreseeable activities are described quantitatively based on acres of elk habitat affected. Impacts of past activities are based on the FACTS database and summarized according to the types of treatments recorded in the database.
Assumptions	The assumptions for describing past and foreseeable treatments are made based on terminology described in FACTS since these definitions are standardized.

Past Activities

The primary activities that have eroded elk security in the cumulative effects area over the past century have been (1) the removal of forested cover by timber harvest and fire (earlier in the 20th century) and (2) ubiquitous road construction. Forest Service timber harvest and fuels treatments have been active over several decades in the project area and beyond, creating a widespread pattern of early-seral and mid-seral habitats amidst mature forest. Some cutting/burning units have been large enough (prior to development of screening saplings) that elk use them as foraging areas only near the edges. Others are small enough to contribute to the kind of cover/forage mosaics that allow animals to feed in close proximity to cover in several directions. The expansion of the open road system has reduced the size of elk security areas. Few permanent open roads have been constructed on Forest lands in the past 25 years. Most new roads have been short access routes to private inholdings. In a number of other cases, previously closed roads have been temporarily opened to allow access for log hauling, mineral exploration, and other activities that have locally complicated elk security patterns for various periods of time.

Past Forest Service timber harvest has resulted in the treatment of 1,647 acres of forested stands in the Black Mountain – Brooklyn Bridge EHU, 1,657 acres in the Jericho EHU, and 1,177 acres in the Quartz Creek EHU (Table 94). Several hundred acres on private land have also been harvested since the 1980s (See Appendix E of the Wildlife Report). Today, these treatments are reflected in the existing condition which is currently at Forest Plan standards in all three herd units for hiding cover and below the Forest Plan standard for thermal cover in the Brooklyn Bridge – Black Mountain and Quartz Creek EHUs. Many of the roads that have been built to facilitate timber harvest remain on the landscape today and are reflected in open road densities in the existing condition.

Fuels activities that occurred in the past in elk habitat mainly focused on reducing surface fuels. Many of these areas that were treated prior to the 1980s have returned to their ‘pre-treatment’ conditions especially in favorable growing conditions that accelerate understory development. Hiding cover has most likely developed in these areas. Fuels activities that have occurred since the 1980s have also reduced surface fuels and created more open conditions that favor shrub and grassland development.

Table 94. Past Forest Service timber harvest activities and their impacts on existing elk habitat.

Decade	Elk Herd Unit	Treatment Type	Acres	Effect
Forest Service Timber Harvest Pre-1960s through 1970s	Black Mountain - Brooklyn Bridge EHU	Regeneration Harvest	436	Past regeneration harvest treatments currently provide hiding cover but it is unlikely that these areas provide thermal cover today. In areas of intermediate harvest, some hiding cover characteristics may be present as well as some thermal cover except in areas where trees have died as a result of mountain pine beetles.
		Intermediate Harvest	1	
	Jericho EHU	Regeneration Harvest	611	
		Intermediate Harvest	16	
	Quartz Creek EHU	Regeneration Harvest	564	
		Intermediate Harvest	0	
Forest Service Timber Harvest 1980s through 1990s	Black Mountain - Brooklyn Bridge EHU	Regeneration Harvest	275	Past regeneration harvest does not yet provide hiding or thermal cover today. Areas that were harvested with intermediate treatments may provide hiding cover characteristics in those stands that are generally more productive (i.e. cool, moist types). Thermal cover has not yet developed in these areas.
		Intermediate Harvest	69	
	Jericho EHU	Regeneration Harvest	641	
		Intermediate Harvest	20	
	Quartz Creek EHU	Regeneration Harvest	262	
		Intermediate Harvest	81	
Forest Service Timber Harvest 2000 to 2014	Black Mountain - Brooklyn Bridge EHU	Regeneration Harvest	558	Past regeneration harvest does not provide hiding or thermal cover.
		Intermediate Harvest	308	
	Jericho EHU	Regeneration Harvest	54	
		Intermediate Harvest	315	
	Quartz Creek EHU	Regeneration Harvest	151	
		Intermediate Harvest	119	

The most influential natural event reducing forest cover in recent years is the mountain pine beetle outbreak (beginning around 2006). The pine beetle outbreak has not yet noticeably diluted hiding cover in most areas because tree trunks that provide much of the cover in mature stands are still upright, but this is about to change over the next decade, although its impact on elk habitat is unpredictable at this point.

Ongoing Activities

Ongoing activities that have effects to elk habitat are summarized below in Table 95.

Table 95. Ongoing activities that may impact elk habitat.

Activity	Effect
Timber Harvest on Private/Non-NFS land	Timber harvest reduces hiding and thermal cover and creates early seral conditions.

Activity	Effect
Livestock Grazing	Ongoing grazing has the potential to reduce the amount of forage available for elk but not to the point that summer or winter range conditions are limiting for elk.
Red Mountain Flume/Chessman Reservoir Project	The Red Mountain Flume/Chessman Reservoir project overlaps with all three herd units; 87 acres of hiding cover is being removed from the Black mountain-Brooklyn Bridge EHU, 4 from Jericho, and 343 from Quartz Creek.
Clancy Unionville Vegetation Manipulation and Travel Management Project	The Clancy-Unionville project may affect some elk thermal cover, but most of the cover habitat would remain suitable. Forage habitat is likely to improve as forested units are thinned, thus promoting early-seral vegetation, including browse. Vegetation treatments have been completed; burning treatments remain. Travel management has improved general elk security, but not affected existing security areas.
Northwestern Energy Powerline	Hazardous tree removal along the powerline corridor near MacDonald Pass may temporarily reduce forage habitat quality, but in the longer term there may be an increase in forage quality as a result of a flush of young growth. The area of suitable elk habitat affected is small relative to that available, and the narrow corridor should not be a deterrent to elk movement in the landscape.

Reasonably Foreseeable Activities

There are three reasonably foreseeable Forest Service actions with implications for elk planned in the cumulative effects area: (1) the Divide Travel Plan, which proposes a variety of changes to current vehicle routes and is likely to improve habitat effectiveness and security for elk summer range and security during the hunting season; (2) the Forest Plan Programmatic Amendment for Big Game Security for the Divide Travel Plan which proposes to update big game standard 4a with a security area concept; and (3) the Telegraph Creek Mountain Pine Beetle Salvage and Precommercial Thinning project which would occur in the Jericho and Little Blackfoot-Spotted Dog EHUs on the west side of the Continental Divide.

The private lands within the project area that are capable of supporting forests are dominated by lodgepole pine, either mature trees or seedling/sapling stands that are the result of regeneration harvest in recent decades. Nearly all of the mature trees have succumbed to mountain pine beetle, much of which has been salvage logged. Because the sawtimber component that is economical to remove has been removed and because the balance of the lands are at least 50 years from again producing saw logs, it is likely that there will be very little if any harvest on the private lands within the project area for the next several years. Much of the lower elevation, more easily accessible component has also been subject to past timber harvest, and there is the potential for reasonably foreseeable harvest. However, the level and timing of this harvest is uncertain. Elk habitat may be impacted if timber harvest occurs in hiding or thermal cover. Security habitat would not be affected by activity on private land.

Cumulative Effects Conclusions for the Action Alternatives

Implementation of alternative 2 or 3 would contribute to the effects associated with past timber and fuels activities that have in part created the existing condition. Specifically, the project area would become more open in the short term while stands regenerate and

understories develop. Implementation of either alternative 2 or 3 would contribute to the effects associated with the ongoing Red Mountain Flume/Chessman Reservoir project, private land timber harvest, and grazing. As stands are thinned, conditions will favor production of herbaceous and shrub habitats that are attractive to livestock for grazing which may compete with wild ungulates for forage. Alternatives 2 and 3 would also add to the impacts associated with annual road maintenance due to temporary road construction associated with those alternatives. Cumulatively, these activities may temporarily disrupt elk movement and habitat use. Travel plan implementation, however, should offset impacts associated with alternatives 2 and 3 because it will result in the creation of large unroaded areas that should provide some additional secure habitat for elk during the summer, calving season, and hunting season.

The Forest Plan programmatic amendment for big game is anticipated to improve the Forest's ability to effectively manage elk habitat during the hunting season. Alternatives 2 and 3 are designed and analyzed to complement this effort.

Irreversible and Irretrievable Commitment of Resources

There are no irreversible or irretrievable commitments of resources.

Conclusions

Elk numbers have steadily increased in HDs 215 and 335 over the last several years while bull/cow ratios have tended to be erratic (Figure 62 and Figure 63). The percentage of mature bulls in the population has decreased which may be an indication of hunting pressure too heavy for the available security during the hunting season. Calf numbers have also been down in the past two years after peaking most recently in 2011; the reason for the drop off in calf production/ survival is unknown but does not appear to be a result of an increase in predation pressure. Several of the challenges faced by elk managers in these hunting districts center on access and elk movement onto private land as well as housing development and an extensive motorized route network.

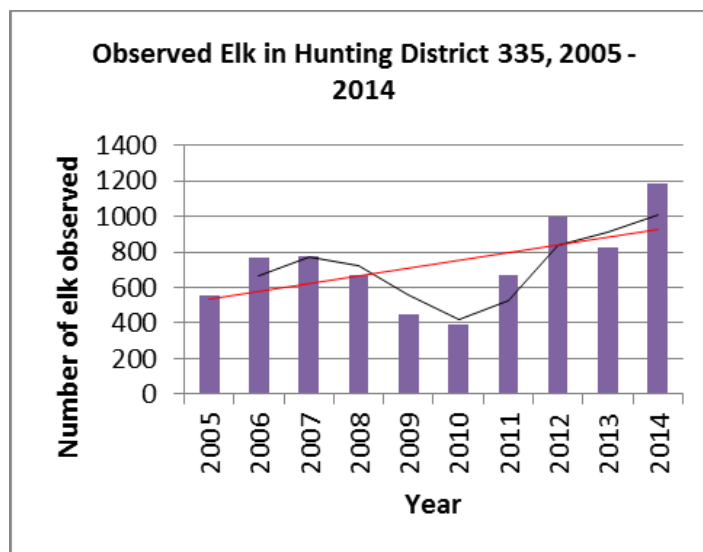


Figure 62. Observed elk in HD 335; 2005-2014. The black line represents the annual fluctuations in numbers of elk observed; the red line indicates trend.

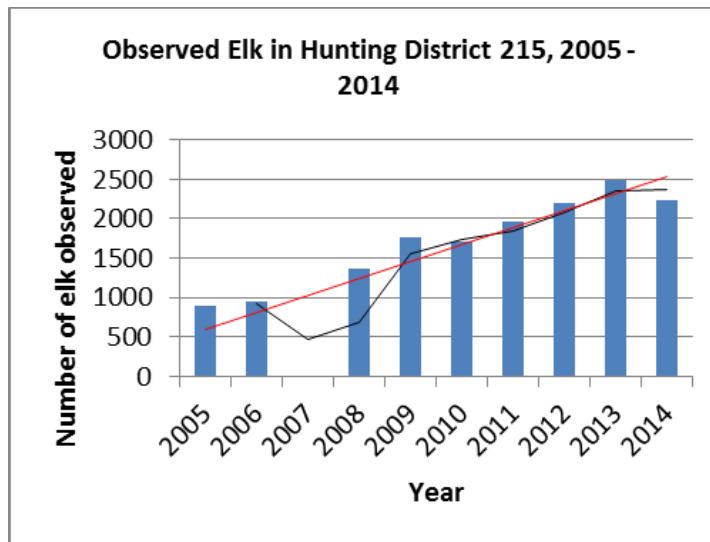


Figure 63. Observed elk in HD 215; 2005-2014. The black line represents the annual fluctuations in numbers of elk observed; the red line indicates trend.

Selection of alternative 1 precludes any immediate loss of hiding or thermal cover. The tree mortality associated with the mountain pine beetle predisposes the project area to further losses in hiding and thermal cover. Natural changes associated with the mountain pine beetle outbreak would generate short and mid-term shifts in the elk habitat use patterns on summer range. Elk in the project area would be likely to make more use of areas with a modicum of surviving green trees associated with productive foraging areas. They would seek out effective patches of hiding cover as well as summer thermal cover (most often associated with stream bottoms with spruce, fir, and Douglas-fir). Accumulations of woody debris would suppress forage development to a certain extent, but forage would be more robust and widespread than under the previous dense forest canopies. As deadfall accumulates, new opportunities for concealing calves would arise.

Implementation of alternative 2 or 3 would result in the immediate removal of hiding and thermal cover, more so in alternative 2. Implementation of alternative 3 would result in retaining more hiding and thermal cover in the short term which could be important in light of the recent tree mortality associated with the mountain pine beetle outbreak. However, in the long term local barriers to movement may be created as dead trees fall. This could provide some security for elk but it could also impede their movement and lengthen the time it takes for those stands to redevelop into hiding and thermal cover.

The temporary road construction and use of temporary roads and haul routes associated with the action alternatives could result in short-term displacement of elk.

Timber harvest and prescribed fire associated with the action alternatives would also remove conifers from winter range (in addition to thermal cover). The removal of conifers from winter range would increase forage but could render these stands less effective at moderating temperature and snow depth. However, Cook et al. (1998, p. 41-48) indicate that thermal cover may be of little value to wintering elk; they may be better able to maintain body condition by taking advantage of the solar radiation associated with open habitats. Overall, while forest cover would decrease on winter range, the removal

of conifers from grasslands, shrublands, and forest understories would increase foraging options for elk on winter range (Van Dyke and Darragh 2005).

Those applicable sections from the Recommendations from the Final Report of the Montana Cooperative Elk-Logging Study, 1970-1985 for Coordinating Elk and Timber Management are included as design elements to minimize effects to elk during implementation of the project. These include:

- Logging activity will be confined to a single drainage at a time with all work completed in the shortest time frame possible. Prior to logging, the project wildlife biologist will work with the pre-sale forester to compartmentalize drainages in order to meet this mitigation measure.
- Logging operations will be prohibited during the entire season in order to maintain big game habitat capability and hunting opportunity.
- All temporary roads will be closed to the public.
- Recreational use of firearms will be prohibited for anyone working within an area closed to the general public.
- Road construction will not occur in elk winter range.
- Slash clean-up inside clearcuts will be reduced below 1.5 feet.
- Timbered areas adjacent to winter foraging areas will be retained where possible while meeting project objectives.

In the long term (20-40 years), implementation of either of the action alternatives should provide the desired habitat conditions of adequate hiding cover to support desired levels of elk, improved forage on winter range, and adequate levels of habitat effectiveness and hunting season security. Cover should regenerate in a manner that mimics or approximates a natural range of variation. Cover will continue to be available in elk security areas; cover would be retained between elk security areas to maintain habitat connectivity and facilitate seasonal movement. The general effect of either action alternative is an immediate removal of existing hiding and thermal cover prior to the decrease in cover that would occur naturally in the next decade as standing dead trees fall. Future hiding cover and forage would become available several years prior to that which would occur without intervention.

Forest Plan Consistency

Elk are a management indicator for commonly hunted species; as such they are intended to be a bellwether of the effects of management activities on representative wildlife habitats with the objective of ensuring that viable populations of existing native and desirable non-native animal species are maintained.

Federal laws and direction applicable to management indicator species include the National Forest Management Act (NFMA), the Forest Service Manual, and the Helena National Forest Plan. The NFMA requires the Forest Service to “provide for diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives” [16 USC 1604(g)(3)(B)]. All alternatives are consistent with this requirement. Elk habitat would continue to be

abundant and well-distributed and species' viability would be maintained across the Forest. See also the Viability Analysis Section.

Big Game Standard 3 – Hiding Cover on Summer Range and Thermal Cover on Winter Range

Big game standard 3 (HFP, p. II/17) requires that hiding cover on elk summer range be maintained at or above 35 percent (or, on in this case, 50 percent crown closure using the MFWP criterion). Hiding cover must be in blocks of at least 40 acres to be tallied as Forest Plan hiding cover. Both action alternatives would result in the reduction of hiding cover but not to the extent that the affected herd units would fall out of compliance.

Standard 3 also requires that thermal cover on winter range be maintained at or about 25 percent in blocks of at least 15 acres. Under alternative 1, only the Jericho herd unit meets the thermal portion of this standard (currently at 25 percent), while the Black Mountain – Brooklyn Bridge and Quartz Creek herd units do not (17 percent and 16 percent, respectively). Alternatives 2 and 3 would further reduce thermal cover on winter range in all three EHUs and reduce the winter range thermal cover such that all EHUs would be out of compliance with standard 3, thermal cover (Table 96). Thus, a site-specific exemption to the standard would be required for either action alternative. Because this thermal cover will be lost by natural means in the next decade or so and because alternatives 2 and 3 are not expected to otherwise negatively impact the elk population in HD 215 and HD 335, an exemption to the standard would be in order.

Table 96. Percent of thermal cover on elk winter range by herd unit and alternative.

Elk Herd Unit	Alternative 1 Percent Thermal Cover on Winter Range	Alternative 2 Percent Thermal Cover on Winter Range	Alternative 3 Percent Thermal Cover on Winter Range
Black Mountain – Brooklyn Bridge	17%	13%	15%
Jericho	25%	8%	9%
Quartz Creek	16%	13%	13%

Big Game Standard 4a – Hunting Season Security

Big game standard 4(a) (HFP, p. II/17-18) requires implementation of an aggressive road management program to maintain or improve big game security (habitat capability and hunting opportunity). This standard is not met under the no action alternative in the Quartz Creek EHU, and is met for the other EHUs. Under alternative 2, none of the EHUs would meet this standard. Under alternative 3, only the Jericho EHU would meet the standard. The cause is not road density increases necessarily, but a lack of hiding cover. The project would decrease cover immediately, whereas alternative 1 would allow it to occur naturally. A site-specific exemption to the standard would be required for either action alternative.

Big Game Standard 4(b) – Calving and Nursery Areas

Forest Plan standard 4(b) requires that elk calving grounds and nursery areas be closed to motorized vehicles during peak use by elk. This is usually from late May through July. While the project area has not been mapped by MFWP or the Helena NF as a calving

ground/nursery area, some calving probably occurs around the meadows and heads of drainages in the project area. Elk with calves probably remain in the general area during the nursing period. A number of roads in and around the project area have been open to public vehicles for several decades without problems for calf production and survival. The temporary roads planned for the project would not be open to public use. Project operations would not occur during the calving season if calving areas have been identified. If nursery sites are discovered during the course of the project, operations would be modified to avoid the sensitive areas. Both action alternatives would be consistent with this standard.

Big Game Standard 4(c) – Winter Range

Forest Plan standard 4(c) (HFP, p. II/18) requires that all winter ranges will be closed to vehicles between December 1 and May 15. Both action alternatives include treatments during the winter in winter range. A site-specific exemption to the standard would be required for either action alternative.

Big Game Standard 6 – Montana Elk-Logging Study Recommendations

Forest Plan standard 6 (Forest Plan II/19 and C/1 -11) requires that the recommendations embodied in the Montana Cooperative Elk-Logging study (Appendix C of the Forest Plan) be followed during timber sale and road construction projects. There are a total of eleven recommendations some of which have been incorporated as design elements as previously described. The following discussion describes the project's consistency with each of the eleven recommendations.

1. Security during logging operations – The action alternatives are consistent with this recommendation. Design elements have been incorporated that confine logging to a single drainage at a time to minimize disturbance to elk. Also, logging activities will be completed in the shortest time frame possible. Use of firearms will be prohibited for anyone working within an area closed to the general public.
2. Redistribution of elk – The action alternatives are consistent with this recommendation which requires that timber sales be planned in a manner that does not redistribute elk onto adjacent or nearby property. Management challenges associated with HDs 215 and 335 do include redistribution of elk to private land (MFWP 2005a, pp. 190-193). The redistribution of elk that is currently occurring in HDs 215 and 335 would not be exacerbated by the action alternatives because design criteria would provide cover habitat in alternate drainages, for example.
3. Traditional home range use by elk – This recommendation is intended to ensure that timber harvest and road construction are planned to minimize impacts to elk and elk hunting. The action alternatives are consistent with this recommendation since all temporary roads will be closed to the public during logging operations and decommissioned post-implementation.
4. Road construction and design – This recommendation is intended to maintain the integrity of elk movement patterns and provide security for unimpeded movement. The action alternatives are consistent with this recommendation in so

far as security either remains the same post-implementation, and all temporary roads will be closed to the public during implementation and decommissioned afterwards. There may be some temporary disruption to traditional movement patterns; however, ample blocks of unroaded areas exist that will provide alternative travel ways. Furthermore, there would be minor beneficial impacts from the proposed road segment closures associated with the project.

5. Road management – This recommendation is also intended to maintain elk security through management of road densities. Implementation of the action alternatives does not affect open road placement.
6. Area closures during the hunting season – This recommendation is intended to ensure that travel restrictions are carefully considered relative to elk management objectives so that hunting opportunities aren't unnecessarily impacted. This recommendation is not applicable to the Tennmile – South Helena project.
7. Clearcuts – This recommendation is intended to ensure that forage produced through clear-cutting is available to elk. The action alternatives are consistent with these considerations since slash clean up inside clearcuts would be reduced to less than 1.5 feet and all temporary roads will be closed to the public. Openings would be generally less than 100 acres. However, there are several larger units proposed, including some that are adjacent to one another thus creating even larger openings. A site-specific amendment would be required for either action alternative.
8. Cover type – This recommendation is intended to ensure that cover types, important to elk, are considered during planning and implementation of silvicultural practices. The action alternatives are consistent with this recommendation since cover type data are available Forestwide (via R1-VMap) and have been utilized for the Tennmile – South Helena project to identify cover and forage.
9. Moist sites – This recommendation is intended to ensure that the integrity of moist sites is maintained since these areas comprise important components of elk habitat. Design elements have been developed to retain green trees, standing snags, and coarse woody debris in and around the fringes of those sites that occur in treatment units. [see "Mitigation/Design Elements" in Chapter 2]. This should preserve their utility for elk and other wide-ranging species as well as for smaller resident mammals, birds, and amphibians.
10. Elk/cattle relationships – This recommendation is intended to ensure that forage created as a result of timber harvest remain available to elk. The action alternatives are consistent with this recommendation since cattle and elk currently comele where they overlap.
11. Winter range – This recommendation states that timbered areas adjacent to primary winter foraging areas should be managed to maintain the integrity of cover and that timber harvest should be scheduled outside of the winter period. Both action alternatives include treatments during the winter in winter range. A site-specific exemption to the standard would be required for either action alternative.

Management Area Direction

There are twelve management areas within the project area and five that have direction relevant to elk habitat (direction is in italics).

Management Area W-1

(1) Wildlife habitat improvement practices, including road management, prescribed fire, and other techniques, will be used to maintain and/or enhance the quality of big game and nongame habitat. Roads to be used for the project activities would be managed to minimize effects to elk during project implementation. Prescribed fire goals include improving grass and shrublands which would be beneficial to elk. Both action alternatives are consistent with this recommendation.

(2) Maintain adequate thermal and hiding cover adjacent to forage areas; this generally means providing at least 25 percent [thermal] cover, where available, on identified winter range. There are 1,412 acres of W-1 in the project area of which 1,296 are considered winter range. Of that, 311 acres are considered Forest Plan thermal cover which is 24 percent, less than Forest Plan thresholds. The two action alternatives would treat thermal cover on 52 acres in winter range in both alternatives 2 and 3. However, Alternative 3 includes more low severity prescribed fire acres than Alternative 2. Remaining Forest Plan thermal cover in W-1 is 263 acres in alternative 2 and 292 in alternative 3. Even though both action alternatives treat 52 acres of thermal cover, the difference in the remaining acres is due to the greater amount of low severity prescribed fire in alternative 3, which has been assumed to not reduce thermal cover. Remaining percentages of thermal cover are 20 percent and 23 percent for alternatives 2 and 3, respectively. A site-specific amendment would be needed to implement either action alternative.

Management Area W-2

(1) Most new roads and about 50 percent of existing roads will be closed, at least seasonally. There are no existing or proposed roads in management area W-2. Therefore this is not applicable.

(2) Wildlife habitat improvement practices, including road management, prescribed fire, and other techniques, will be used to maintain and/or enhance big game calving and summer habitat. The project is designed to avoid calving and nursery areas; elsewhere prescribed fire in summer habitat should improve forage conditions.

(3) Maintain adequate thermal and hiding cover adjacent to forage areas. Twelve acres of thermal cover would be treated with low severity prescribed fire in alternative 2. There are no treatments in thermal cover in alternative 3. Since low severity prescribed fire is assumed to not reduce thermal cover, the status quo would be maintained under implementation of alternative 2 and consistency with this standard is retained.

Management Area H-1

Maintain adequate thermal and hiding cover adjacent to forage areas. Generally this means providing at least 25 percent thermal cover, where available, on winter range. The existing thermal cover condition is 19 percent; alternatives 2 and 3 would reduce it to 17

percent and 16 percent respectively). A site-specific amendment would be needed to implement either action alternative.

Management Area H-2

Maintain adequate thermal and hiding cover adjacent to forage areas. Generally this means providing at least 25 percent thermal cover, where available, on winter range. Currently there is only 9 percent of thermal cover on winter range in MA H-2 which is already below the 25 percent threshold. Alternatives 2 and 3 would reduce this amount to 7 percent and 5 percent, respectively. A site-specific amendment would be needed to implement either action alternative.

Management Area L-2

Maintain adequate thermal and hiding cover adjacent to forage areas. Generally this means providing at least 25 percent thermal cover, where available, on winter range. In this management area approximately 33 percent of the winter range is in thermal cover. Under the alternatives 2 and 3, this would change to 21 percent and 25 percent in alternatives 2 and 3, respectively. A site-specific amendment would be needed to implement alternative 2.

Management Area T-3

(1) Maintain thermal cover adjacent to forage areas. There are broad parks adjacent to thermal cover in this management area. Treatment effects would vary, from substantial cover reductions associated with improvement cuts to more cover retention in prescribed fire units. Thermal cover would not be retained adjacent to all forage areas in T-3. Therefore a site-specific amendment would be needed to implement either action alternative.

(2) Maintain a minimum of 35 percent hiding cover for big game. There are 211 acres of hiding cover (80 percent) in this management area in the existing condition. Alternative 2 would treat all of those acres; alternative 3 would also treat all 211 acres although 41 of those acres would be treated with precommercial thinning which is designed to retain hiding cover in alternative 3. There would be less than 1 percent and 17 percent hiding cover remaining in alternatives 2 and 3 respectively. A site-specific amendment would be needed to implement either action alternative.

(3) Wildlife habitat improvement practices, including road management, prescribed fire, and other techniques, will be used to maintain and/or enhance the quality of big game summer habitat. The project is designed to improve forage conditions. Prescribed fire goals include improving grass and shrublands as well as promoting open grown forests that are beneficial to elk and deer.

(4) Openings created by timber harvest will be reforested to the extent necessary to meet the hiding cover requirements of big game before harvesting adjacent areas. Timber harvest is proposed in T-3; however, past timber harvest within T-3 is currently providing hiding cover.

Mule Deer

Affected Environment

Mule Deer Biology

Of the two deer species that inhabit the Helena NF, the mule deer (*Odocoileus hemionus*) is the more common. In spring, summer, and fall, mule deer are most often found in montane habitats from the foothills on up into the high alpine zone, whereas white-tailed deer (*Odocoileus virginianus*) focus much of their activity on riparian bottomlands, lowland forest, and agricultural lands in the valleys—most of it off the Forest (Foresman 2012, p. 384-393). In winter, both species occupy winter ranges in the lower foothills and valleys, sometimes living in close proximity to one another when deep snow forces them into the same areas (Costain, B., Helena Ranger District wildlife biologist field observations, 1978-2014).

Like elk, the mule deer serves as a management indicator species (MIS) for hunted wildlife on the Helena NF. Most big game standards and guidelines in the Helena Forest Plan, however, are directed specifically at elk—the assumption being that management aimed at the needs of elk will automatically take care of mule deer (and other big game species). This is true to a degree, but deer are different enough from elk that resource management—vegetation manipulation, in particular—needs to account for certain local habitat configurations that are important specifically to deer (Pac et al. 1991, pp. 276-280). Favorable habitat features include local patches of hiding cover, dense thermal cover stands on winter range, palatable shrubs on winter range, diversity of forbs on summer range, structurally diverse forest (irregular canopy, complex layering, and understory patchwork), tight juxtaposition of cover and forage, and topographic diversity (Mackie et al. 1998, p. 40-66, 135-138; Pac et al. 1991, pp. 274-280).

Mule deer populations have exhibited pulses of population increase/decrease over periods of 10-20 years. In the 1970s, these changes were tied to overhunting, but more recent cycles have been driven primarily by local climate conditions (drought, severe winter), which suppress fawn recruitment. In some areas, these factors have been aggravated by predation and hunting, which elevate adult mortality (Mackie et al. 1998, p. 123-128). While direct manipulation of these processes in order to stabilize and recover depressed mule deer populations is beyond the scope of habitat managers, maintenance of favorable habitat can ameliorate some of the negative impacts (Mackie et al. 1998, p. 135-138).

As with elk, a majority of mule deer in the project area over-winter on private and State land in the foothills and valleys. Unlike elk, however, not all deer move as a large group to high elevation summer ranges. Some may remain in the valleys all year: the deer population in the City of Helena, for example, is a year-round resident population, distinct from adjacent migratory groups [this is a mixed population of mule and white-tailed deer]. Some of the other deer that winter in the valley move only a short distance up onto neighboring HLCNF land where they remain through the fall. This is an example of what Pac et al. (1991, p. 97) call “adjacent” seasonal ranges. More continue on to more distant summer ranges at higher elevation—an example of “distinct” seasonal ranges (Pac et al. 1991, p. 97). These migrating deer tend to follow the spring green-up as it spreads from the valleys up through the foothills and into the montane summer ranges in June.

Mule deer are in the rut for much of the hunting season in October and November, and bucks are often on the move within their fall ranges. Because deer are less inclined than elk to move off local ranges to security areas several miles away (Mackie et al. 1998), they often rely on local hiding cover to avoid hunters. Thus, local blocks of hiding cover outside of unroaded security areas are often more important to deer than to elk. Small patches of cover (considerably less than the 40 acres recommended for elk) can provide effective escape enclaves for mule deer.

As a rule, the quality of summer range (not winter range) is the primary factor regulating deer numbers (Mackie et al. 1998, p. 131; Pac et al. 1991, p. 279). In mountain and foothill environments, summer habitat should provide high forage quality (of leafy forbs) and security for fawn rearing. Management should emphasize habitat diversity (Mackie et al. 1998, p. 136). Mature and over-mature conifer stands with multiple layers, numerous openings, abundant edge, and inclusions of other diverse micro-communities are ideal (Mackie et al. 1998, p. 49, 55; Pac et al. 1991, p. 279). A balance of high-quality forage, summer thermal cover, and screening/hiding cover are important for raising fawns and building energy reserves for winter survival and future fawn production.

While summer nutrition may be the key factor that provides deer the wherewithal to survive the winter, effective winter habitat is also important, allowing animals to hold onto as much of their accumulated body weight as possible. Pac and others (1991, p. 276) emphasize the need to manage mule deer winter ranges as maintenance habitat where animals can conserve energy. Their studies in the Bridger Range of southwest Montana suggest that forage characteristics are often of secondary importance and that local topography and the abundance of conifer stands that can ameliorate snow depth and temperature are the key factors. The conclusion that thermal cover (equal to or greater than 70 percent canopy closure) is seldom a key habitat component for elk on winter range [see previous discussion of elk winter range] does not necessarily apply to deer. Research indicates that mule deer are more dependent on thermal characteristics of forest cover than are elk. At least on some winter ranges, deer appear to require dense stands of mature timber with canopy closure in excess of 60 percent to withstand prolonged bouts of severe winter weather. While typically deficient in forage, these stands can provide a favorable thermal environment and minimize snow depth (Mackie et al. 1998, p. 52, 136; Pac et al. 1991, p. 77, 276, 279).

While deer are more likely than elk to become habituated to open roads and attendant human activity (as common observation across the Helena NF and adjacent lands will attest; Costain, B., Helena Ranger District wildlife biologist), most deer do in fact avoid roads as much as possible (Rost and Bailey 1979). As a result, regular vehicle traffic will lower habitat effectiveness, reducing the amount of habitat that deer find suitable for foraging, resting, raising young, and escaping from perceived danger. The impact of roads on deer summer habitat in general can be estimated via the “habitat effectiveness” indices calculated for elk summer range. But, as with elk, the specific roads that limit the ability of deer to use key habitat sites are the primary disruptive influence.

Deer in many sub-populations have adapted to living in close proximity to humans, especially in winter (as in numerous local subdivisions and in the City of Helena). But,

those that winter on less-settled agricultural lands and in the foothills are more likely to try to avoid humans in winter. Some researchers have noted that in order to minimize all responses by mule deer to snowmobiles or hikers, they would have to be more than 350 meters (about 1150 feet) away (Freddy et al. 1986). Perry and Overly (1976) recommended a distance of one half mile away to prevent disturbance and displacement of mule deer. They found that mule deer were interrupted more often, and longer, by persons afoot than by snowmobiles.

Mule Deer Habitat and Population Status in the Project Area

Mule deer numbers have cycled up and down over past decades, hitting low points in the 1970s, 1990s, and again, beginning in 2012. MFWP does not survey deer as rigorously as elk in the hunting district (HD) that overlaps the project area (HD 335)—picking them up incidentally during elk winter range flights—and as a result, population estimates are often murky. However, the aerial surveys of elk/deer winter ranges, check station data, hunter surveys, and field observations by biologists provide enough information on population trends to allow the Fish and Game Commission to make yearly adjustments in the allowable mule deer harvest.

Wildlife field surveys near the project area since 2009 indicate that, even with area-wide populations at a low ebb, mule deer are common and widespread. Recent estimates by Montana Fish, Wildlife, and Parks indicates a relatively level population of mule deer in Region 3 (southwestern Montana) (Montana Fish, Wildlife, and Parks 2014). Most of the project area includes spring, summer, and fall range, and mule deer are present across much of the area from mid-April into November. About half of the project area is also mule deer winter range (Figure 64).

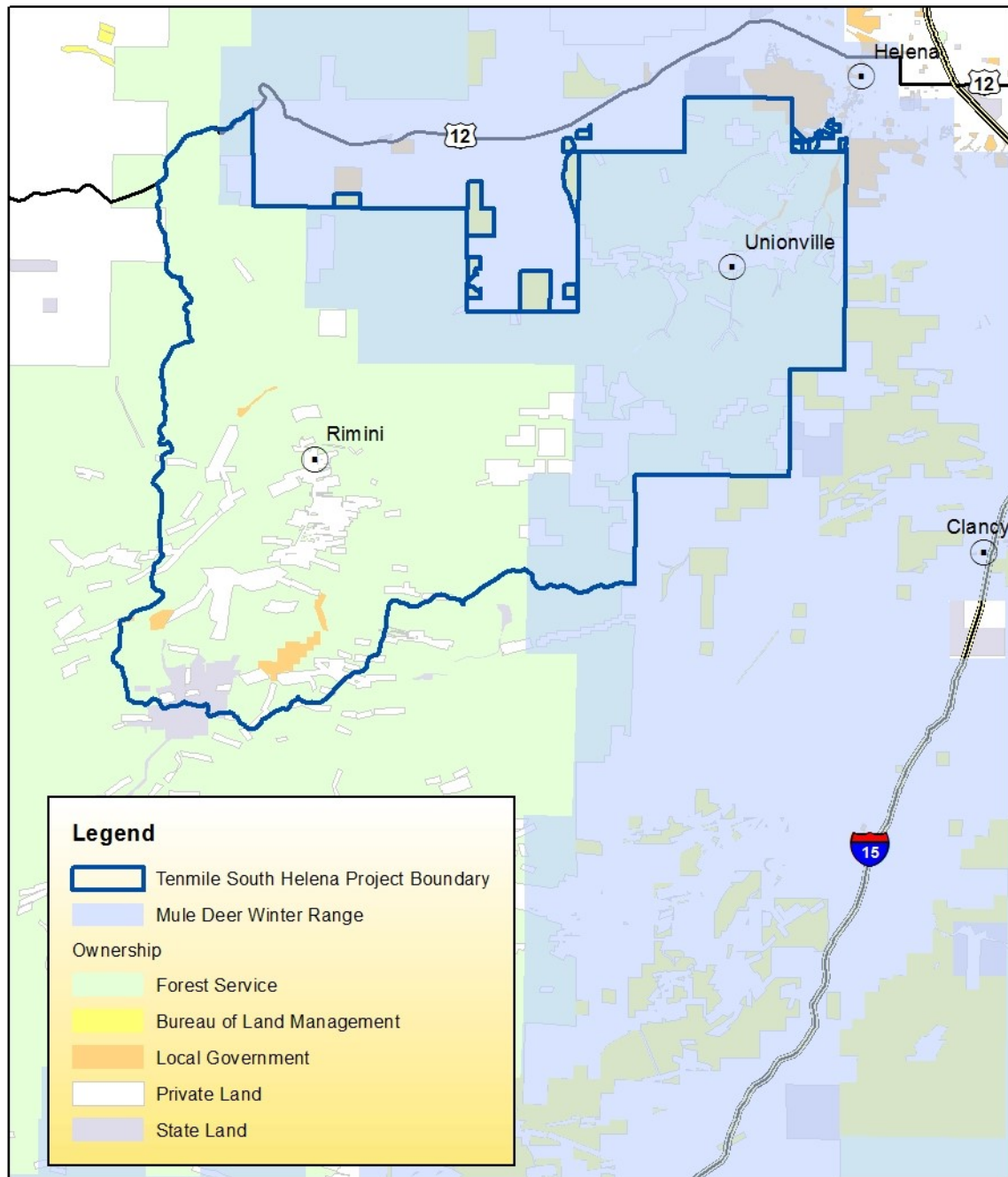


Figure 64. Mule deer winter range in the Tenmile – South Helena project (from MFWP).

The project area offers a diversity of habitat types, seral stages, vegetation structure, and productivity levels. The mature lodgepole pine forests that dominate much of the project area vary widely in the kind of hiding and summer thermal cover they provide and the quality and abundance of forested forage. While some of the older stands on productive sites support palatable forbs in the understory, ground cover in a majority of stands is characterized by less palatable fare, such as pinegrass and grouse whortleberry, or by needle mats bereft of worthwhile forage. Foraging opportunity for deer in these stands is in the forest openings and along edges. Douglas-fir stands, in general, provide more productive foraging conditions for mule deer.

Much of the juxtaposition of different habitat structures throughout the project area has been created by past timber harvest—typically clearcuts of less than 40 acres—that have been punched into the mature forest continuum. Most timber harvest occurred prior to the early 1990s, and these sites are now dominated by sapling conifers with robust ground vegetation—habitats that provide mule deer with a diversity of summer forage amidst hiding and screening cover. Natural openings—most of them relatively small—also provide numerous foraging sites of varying quality throughout the forest. The most effective are those that also qualify as riparian or wetland sites—wet meadows and smaller openings along streams, around springs, and in drainage-head basins.

Mule deer have been observed to make use of most habitat configurations in the project area to one degree or another (Costain, B., Helena Ranger District wildlife biologist). They tend to forage most often in riparian and wetland sites, in open habitats (clearcuts; natural grasslands and meadows) with an abundance of forbs, in aspen stands, and along edges and ecotones (primarily between mature forest and natural openings or early seral forest). They will, however, forage in the understories of forest stands where ground vegetation is well-developed, particularly on hot summer days or when keeping a low profile during hunting season. While they most often bed down in mature forest environments, they will do so in any site that provides some concealment and a vantage point from which they can anticipate potential threats. The same is true for areas where they conceal fawns, though sites with a supply of shrubs or logs are used most frequently.

The effect of the mountain pine beetle outbreak to this point has been to substantially cut down on the availability of effective summer thermal cover. Deep shade is now available only in stands of green Douglas-fir, subalpine fir, Engelmann spruce, and a few patches of aspen. Defoliation of the mature lodgepole pine forest has not yet produced a flush of new growth in understory vegetation, but eventually, forage quality and abundance should increase over broad areas. Likewise, because most beetle-killed trees are still standing, hiding and screening cover remain largely intact. This cover will diminish substantially over the next five to ten years. Accumulation of deadfall will also serve to alter mule deer travel routes and provide for new concealed resting sites and areas for hiding fawns. Mule deer are adaptable animals, and it is unlikely that these changes will significantly reduce the ability of the project area to support populations similar to what have inhabited the area in past decades.

Forest Plan thermal cover, while focused primarily on elk habitat, can provide a rough estimate of available mule deer winter range habitat. With this in mind, Forest Plan thermal cover available for mule deer totals about 11,663 acres in the project boundary, including the BLM portions. Of this total, 6,454 acres occurs on winter range.

Environmental Consequences

The following measures are evaluated to analyze effects to mule deer:

- Effects to reproductive habitat
- Effects to summer habitat
- Security during the hunting season

Desirable Habitat Conditions

- ✓ Early successional habitats where forbs, grassy plants, and shrubs dominate
- ✓ Mosaic of habitats that can provide food and cover
- ✓ Effective winter range

- Effects to winter range

Effects Common to All Alternatives

Untreated portions of the project area will continue to progress through succession regardless of alternative. Disturbance processes including climate change, insect infestations, disease, and fire will continue to influence the project area. At any given time, the project area will comprise a variety of successional stages. Some of the thermal cover on winter range will be reduced by mountain pine beetle-related mortality or through timber harvest.

Effects Common to All Action Alternatives

Effective mule deer reproductive habitat (fawning and lactation periods) generally is located at intermediate elevations in diverse, mesic montane forests with dependable sources of succulent, high quality forage. Timber harvest and burning in all action alternatives would reduce cover in the short term rendering some areas unsuitable as fawning habitat until the understory regenerates. Over 60 percent of the project area would not be treated and, as such, where uneven-aged forests exist they will remain largely intact. These uneven-aged stands provide a mosaic of high quality forage and security for fawn rearing.

Mule deer summer habitat usually consists of subalpine-alpine and shrub grassland habitats. Timber harvest and prescribed burning in the short term would remove conifers that may provide cover and will also temporarily reduce forage availability until shrubs and forbs are rejuvenated. In the long term, harvest and burning treatments will result in patterns of habitat that are desirable to mule deer – i.e. early successional habitats where forbs, grasses, and shrubs dominate and are interspersed with cover.

Security during the hunting season is provided by well-distributed patches of cover and limited road access. Impacts of roads on mule deer, especially during the hunting season, have been well-documented (Thomas 1979 pp. 104-127, Witmer et al. 1995 as cited in Hayden et al. 2008, Stewart et al. 2002). All action alternatives would result in the removal of some cover in temporary road construction and use of roads closed to the public for haul routes.

During the winter, mule deer move to lower elevations of the project area. Timber harvest will result in the removal of some thermal cover on mule deer winter range, the effects of which will last for several decades as treated stands move through succession. Prescribed burning will reduce forage in the short term, but forage is expected to improve as shrubs re-sprout and become more nutritious.

No old growth or wetland/riparian areas would be directly treated under any action alternative. Old growth stands provide both thermal benefits and snow interception because of their structure and canopy cover (Kirchhoff and Schoen 1987). Functionally similar, forested wetland and riparian areas often have dense cover and horizontally diverse canopies. As a result deer expend less energy travelling through shallower snow in these stands and they find more rooted forage that remains snow-free (Parker et al. 1984). Incidental removal of the occasional tree from wetland/riparian or aspen stands,

and allowing prescribed fire to back into these areas should not substantially affect the ability of these areas to provide quality habitat for deer.

Alternative 1

Direct/Indirect Effects

There are no direct effects to mule deer habitat under alternative 1. In areas of mountain pine beetle-related tree mortality, understory forage habitat should increase as the tree canopy continues to open up and competition from conifers is reduced. Conversely, shrub and grassland habitats will continue to undergo competition from conifers and will most likely continue to decline with a subsequent reduction in forage habitat.

Early successional habitat is important for mule deer; in the absence of fire, the mountain pine beetle is the primary disturbance factor creating this type of mule deer habitat. Should a fire ignite in the project area today, it's likely to be large and hot. Hot fires affect the ability of an area to regenerate and can reduce site productivity which could lead to long-term changes in mule deer habitat.

Alternative 1 will not necessarily render the project area more suitable for mule deer. Thermal cover will continue to decline in stands susceptible to mountain pine beetle; however, most of the forested stands on mule deer winter range are mixed conifer so these stands will continue to ameliorate the effects of winter.

No Action Alternative Cumulative Effects

While there can be no cumulative effect from no action being taken, a discussion of the likely trajectory of the mule deer habitat in the project area may prove beneficial.

With no action there would be no immediate change in cover or forage in the project area. However, that is all very likely to be substantially different within a decade as standing dead trees and those soon to be dead will begin to rot at the base and fall over. The amount of cover has been reduced in the last five years and will continue to deteriorate as trees begin to fall. The lack of cover may increase hunter success with increased sight capability. Conversely, forage production should rapidly increase as a result of decreased overstory cover and increased water availability. Fawning areas may be more secure with deadfall, even though movement through such areas may prove initially challenging. All of these changes are expected to continue as they currently exist through the indefinite future. The proposed action alternatives would impart changes to some of the area sooner than that which would occur naturally.

Alternatives 2 and 3

Direct/Indirect Effects

Implementation of alternative 2 would result in the regeneration of 4,001 forested acres; intermediate harvest is proposed on 2,955 forested acres; prescribed burning is proposed on 17,303 acres including both forested and non-forested acres. Regeneration harvest would remove cover, mostly standing dead cover because of the mountain pine beetle outbreak, in the short term while improving forage habitat. Because deer are attracted to young clearcuts during snow free months because of their forage value (Yeo and Peek 1992), regeneration harvest treatments should be beneficial to mule deer. Intermediate

harvest, as well as prescribed burning in forested areas, would also reduce cover, albeit to a lesser extent than regeneration harvest, while creating conditions favorable to forage production. Trees that remain after treatment should provide some hiding cover as should untreated areas. Prescribed burning in grass and shrublands would reduce standing biomass of ground vegetation immediately, but should lead to a rapid improvement in forage quality in these habitats.

Approximately 5,119 acres of thermal cover will be treated under alternative 2. Of these, 1,376 acres will be treated with intermediate harvest, 574 acres will be regenerated, and 3,169 acres will be treated with prescribed fire. Those acres treated with intermediate harvest and prescribed fire should still provide some snow intercept properties after treatment while also resulting in breaks in the canopy cover that would allow sunlight to reach the forest floor to produce forage habitat. The untreated thermal cover totals 3,203 acres.

A portion of the above treatments occur within thermal cover on mule deer winter range. This subset includes 1,021 acres of intermediate harvest, 140 acres of regeneration harvest, and 2,090 acres of prescribed fire. Untreated winter range thermal cover is about 3,203 acres. The effects to deer habitat are the same as in the broader thermal cover, i.e., regeneration harvest effects will last for several decades as treated stands move through succession; and the other treatments may effect slight reductions in cover, but should in general increase forage quality, in particular the prescribed fire treatment which should recover quickly as shrubs re-sprout and become more nutritious.

Alternative 3 would result in regeneration of 2,450 forested acres; intermediate harvest is proposed on 1,827 forested acres; prescribed burning is proposed on 13,836 acres including both forested and non-forested acres. Effects are similar to those described for alternative 2 except that fewer openings would be created in Alternative 3.

Approximately 3,808 acres of thermal cover would be treated under alternative 3. Of these, 972 acres would be treated with intermediate harvest, 444 acres would be regenerated, and 2,232 acres would be treated with prescribed fire. The effects to thermal cover are the same as in alternative 2.

As in alternative 2, a subset of the treated acres occurs in thermal cover on mule deer winter range. The effects are the same as in alternative 2, only differing in quantity. The affected area of thermal cover on winter range includes 555 acres of intermediate harvest; 36 acres of regeneration harvest; and 2,666 acres of prescribed fire. The untreated thermal cover totals 3,788 acres.

Both action alternatives include consideration of aspen. It would be favored in treatment units where it occurs. Aspen is a preferred forage species for mule deer.

Alternative 2 would result in the construction of approximately 43 miles of temporary roads and in alternative 3, about 24 miles. These would be closed to the public and would be obliterated at project's end. About 56 miles of closed roads would be used as haul routes in alternative 2 (including the temporary roads), and 30 miles under alternative 3; these all would remain closed to public vehicle use.

All project activities may disrupt and displace mule deer for the duration of those activities, and during the hours of activity. Mitigation measures that are in place for elk should also minimize impacts to mule deer. These include: (1) confining logging activity to a single drainage at a time so that mule deer have undisturbed areas into which they can displace during logging activity and (2) prohibiting public use on temporary roads. Temporary roads would be decommissioned after project completion. As such, there would be no increase in the open motorized route length or density as a result of temporary road construction.

Action Alternatives Cumulative Effects

Cumulative effects are the incremental impacts that the direct and indirect effects associated with the action alternatives have on mule deer habitat in the context of the myriad of other past, present, and future effects on mule deer habitat from unrelated activities. The cumulative effects analysis considers spatial and temporal boundaries, how past activities have contributed to the existing condition, and whether the ecosystem can accommodate additional effects. Table 97 below summarizes the key items that are taken into consideration for the cumulative effects analysis for mule deer habitat. See also DEIS - Appendix C, Cumulative Effects, for more information.

Table 97. Cumulative Effects Considerations for Mule Deer Habitat in the Tenmile – South Helena Project

Parameter	Discussion
Spatial Boundary	The spatial boundary is expanded to the point at which mule deer habitat is no longer measurably affected. The project boundary satisfies this requirement because this is the scale at which the effects to mule deer habitat can be examined at the stand or treatment unit. This boundary also provides a sufficient landscape to assess pattern and structure in the context of larger processes.
Temporal Boundary	The temporal boundary ranges from the 1960s (due to a lack of earlier records in the FACTS database) to those future projects that are either listed in our SOPA or are planned or implemented on private land within the herd unit boundaries.
Past Activities and Existing Condition	The effects of past activities are reflected in the existing condition. Past activities shaped the age class, density, and species composition of the mule deer habitat that comprise the project area today. The existing condition, which incorporates the changes due to past activities, has been measured by remote sensing and field validation.
Activities Considered in Cumulative Effects	Past activities that are included in the cumulative effects analysis include timber harvest, fuels activities, private land timber harvest, livestock grazing, special use permits, the Forest-wide Roadside Hazard Tree Removal and Fuels Reduction Project, among others.
	Ongoing and future activities include the Red Mountain Flume/Chessman Reservoir project, Telegraph project, livestock grazing, noxious weed treatments, annual road maintenance, Divide Travel Plan, and private land timber harvest.
Measurement Indicators	Measurements include effects to thermal and hiding cover, forage, and open road densities.
Thresholds	There are no specific thresholds for mule deer.
Methods	Past, ongoing, and reasonably foreseeable activities are described quantitatively based on acres of mule deer habitat affected. Impacts of past activities are based on the FACTS database and summarized according to the types of treatments recorded in the database.

Parameter	Discussion
Assumptions	The assumptions for describing past and foreseeable treatments are made based on terminology described in FACTS since these definitions are standardized.

Past Activities

Past Forest Service timber harvest has resulted in the treatment of 2,099 acres of forested stands. Less than one hundred acres on private land have also been harvested since the early 2000s. The most recent and visible activity in the project area is the Helena National Forest Forest-wide Roadside Hazard Tree Removal and Fuels Reduction Project, which removed hazard trees along many forest roads in the project area. In addition, fuels projects have occurred on just over 4,900 acres. Today, these treatments are reflected in the existing condition. Table 98 summarizes the effects of timber harvest during three time periods on mule deer habitat currently existing within the project area. Many of the roads that have been built to facilitate timber harvest remain on the landscape today and are reflected in open road densities in the existing condition.

Fuels activities that occurred in the past in mule deer habitat mainly focused on reducing surface fuels. Many of these areas that were treated prior to the 1980s have returned to their 'pre-treatment' conditions especially in favorable growing conditions that accelerate understory development. Hiding cover has most likely developed in these areas. Fuels activities that have occurred since the 1980s have also reduced surface fuels and created more open conditions that favor shrub and grassland development.

Forest Service timber harvest and fuels treatments have been active over several decades in the project area and beyond, creating a widespread pattern of early-seral and mid-seral habitats amidst mature forest.

Table 98. Past Forest Service timber harvest activities in the project area and their impacts on existing mule deer habitat

Decade	Treatment Type	Acres	Effect
Forest Service Timber Harvest Pre-1960s through 1970s	Regeneration Harvest	489	Past regeneration harvest treatments currently provide hiding cover but it is unlikely that these areas provide thermal cover today. In areas of intermediate harvest, some hiding cover characteristics may be present as well as some thermal cover except in areas where trees have died as a result of mountain pine beetles.
	Intermediate Harvest	3	
Forest Service Timber Harvest 1980s through 1990s	Regeneration Harvest	335	Past regeneration harvest does not provide hiding or thermal cover today. Areas that were harvested with intermediate treatments may provide hiding cover characteristics in those stands that are generally more productive (i.e. cool, moist types). Thermal cover has not yet developed in these areas.
	Intermediate Harvest	104	
Forest Service Timber Harvest 2000 to 2014	Regeneration Harvest	637	Past regeneration harvest does not provide hiding or thermal cover.
	Intermediate Harvest	513	

The most influential natural event reducing forest cover in recent years is the mountain pine beetle outbreak (beginning around 2006). The pine beetle outbreak has not yet substantially reduced hiding cover in most areas because tree trunks that provide much of the cover in mature stands are still upright. However, this will change over the next decade as standing dead trees begin to fall down in greater numbers, although its impact on mule deer cover is unpredictable at this point.

Ongoing Activities

Ongoing activities that have effects to mule deer habitat are summarized Table 99. The primary effects to mule deer are vegetation changes associated with the large vegetation management projects occurring in the cumulative effects boundary (i.e. project boundary). While there may be temporary disturbance from motor vehicle use along designated routes, it is reasonable to expect that deer are acclimated to and avoid existing disturbance.

Table 99. Ongoing activities that may impact mule deer habitat

Activity	Effect
Timber Harvest on Private/Non-NFS land	Timber harvest reduces hiding and thermal cover and creates early seral conditions.
Livestock Grazing	Ongoing grazing has the potential to reduce the amount of forage available for mule deer but not to the point that summer or winter range conditions are limiting for mule deer.
Red Mountain Flume/Chessman Reservoir Project	The Red Mountain Flume/Chessman Reservoir project affects 434 acres of hiding cover in the Tenmile – South Helena project area. Effects to mule deer are minimal.
Clancy Unionville Vegetation Manipulation and Travel Management Project	The Clancy-Unionville project may affect some mule deer thermal cover habitat, but most of the cover habitat would remain suitable. Forage habitat is likely to improve as forested units are thinned, thus promoting early-seral vegetation, including browse. Vegetation treatments have been completed; burning treatments remain.
Northwestern Energy Powerline	Hazardous tree removal along the powerline corridor near MacDonald Pass may temporarily reduce cover, but in the longer term there may be an increase in forage quality as a result of a flush of young growth. The area of suitable deer habitat affected is small relative to that available, and the narrow corridor should not be a deterrent to deer movement in the landscape.

Reasonably Foreseeable Activities

There is one reasonably foreseeable Forest Service action with implications for mule deer planned in the cumulative effects area: the Divide Travel Plan, which proposes a variety of changes to current vehicle routes and is likely to improve habitat effectiveness for mule deer summer range and security during the hunting season.

The private lands within the project area that are capable of supporting forests are dominated by lodgepole pine, either mature trees or seedling/sapling stands that are the result of regeneration harvest in recent decades. Nearly all of the mature trees have succumbed to mountain pine beetle, much of which has been salvage logged. Because the sawtimber component that is economical to remove has been removed and because the balance of the lands are at least 50 years from again producing saw logs, it is likely that there will be very little if any harvest on the private lands within the project area for the next several years. Much of the lower elevation, more easily accessible component has also been subject to past timber harvest, and there is the potential for reasonably foreseeable harvest. However, the level and timing of this harvest is uncertain. Mule deer habitat may be impacted if timber harvest occurs in hiding or thermal cover.

Cumulative Effects Conclusions for the Action Alternatives

Implementation of alternative 2 or 3 would contribute to the effects associated with past timber and fuels activities that have in part created the existing condition. Specifically, the project area would become more open in the short term while stands regenerate and understories develop. Implementation of either alternative 2 or 3 would contribute to the effects associated with the ongoing Red Mountain Flume/Chessman Reservoir project, private land timber harvest, and grazing. As stands are thinned, conditions will favor

production of herbaceous and shrub habitats that are attractive to livestock for grazing which may compete with wild ungulates for forage. Alternatives 2 and 3 would also add to the impacts associated with annual road maintenance due to temporary road construction associated with those alternatives. Cumulatively, these activities may temporarily disrupt mule deer. Travel plan implementation, however, should offset impacts associated with alternatives 2 and 3 because it would result in the creation of large unroaded areas that should provide some additional secure habitat for mule deer.

Irreversible and Irretrievable Commitment of Resources

There are no irreversible or irretrievable commitments of resources.

Conclusions

The number of mule deer has increased since the early 20th century with the 1950s and 1960s considered the 'hey days' of mule deer populations after which mule deer numbers began to decline. Today, several factors have come together to lessen the ability of a region to produce and maintain mule deer. Of particular concern in the project area are those habitat changes that have been brought about by fire suppression. Fire is a critical factor in creating and maintaining mule deer habitat because it sets back succession and can create a mosaic of cover and forage that can benefit mule deer depending on severity and intensity of the fire. Prior to the mountain pine beetle outbreak, most of the project area consisted of mid-successional closed-canopied forests that offered little in terms of forage habitat. Recently, the mountain pine beetle-related tree mortality has created conditions that allow more sunlight to reach the forest floor which in turn should eventually lead to increases in forage habitat.

Selection of alternative 1 precludes any immediate loss of hiding or thermal cover. As trees die due to the mountain pine beetle, understory shrubs and forbs should increase, providing forage for mule deer until dead trees fall. Once these trees fall, access to forage may be difficult. Other portions of the project area that are not impacted by the mountain pine beetle would continue to provide cover. However, while these forested stands would continue to offer places for mule deer to retreat from hunting pressure or severe weather, they would provide very little in terms of forage habitat.

Implementation of alternative 2 or 3 would result in the removal of hiding and thermal cover, more so in alternative 2. In the long run, alternative 2 may be more beneficial for mule deer because more acres are proposed for regeneration and intermediate harvest, which in turn will result in a mosaic of early successional forage habitat and cover. Implementation of alternative 3 would result in retaining more hiding and thermal cover in the short term which could be important in light of the recent tree mortality associated with the mountain pine beetle outbreak. However, in the long term local barriers to movement may be created as dead trees fall. This could provide some security for mule deer but it could also impede their movement and lengthen the time it takes for those stands to regenerate to hiding and thermal cover. The temporary road construction associated with the action alternatives could result in temporary displacement of mule deer, but because the roads would not be open to motorized vehicle use, there would not be long term reductions in security habitat.

Mitigation measures that are in place to minimize impacts to elk also benefit mule deer. These include:

- Minimizing impacts to security during logging operations by limiting logging activities to one drainage at a time
- Closing temporary roads to public use.

The increase in local habitat diversity and forage productivity generated by the new open habitats in juxtaposition with adjacent dead tree habitat is expected to prove more attractive to mule deer than the current environment. Use of the area from May through September is likely to increase. The immediate loss of forest cover would increase the hunting vulnerability in the treatment units; but, given the abundance of cover in surrounding habitats (and no changes in motorized hunter access), the change would not be meaningful. Eventually, the area-wide loss of cover throughout both treated and untreated habitats will prove problematic for mule deer during the hunting season, but this scenario would come about under any alternative.

Forest Plan Consistency

Mule deer are a management indicator for commonly hunted species; as such they are intended to be a bellwether of the effects of management activities on representative wildlife habitats with the objective of ensuring that viable populations of existing native and desirable non-native animal species are maintained. Federal laws and direction applicable to management indicator species include the National Forest Management Act (NFMA), the Forest Service Manual, and the Helena National Forest Plan. The NFMA requires the Forest Service to “provide for diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives” [16 USC 1604(g)(3)(B)]. All alternatives are consistent with this requirement. Mule deer habitat would continue to be abundant and well-distributed and species’ viability would be maintained across the Forest. See also the Viability Analysis Section.

Big Game Standard 1

Big Game standard 1 (HFP, p. II/17) requires that on important summer and winter range, adequate thermal and hiding cover will be maintained to support the habitat potential. Adequate thermal and hiding cover would remain on big game summer and winter range for mule deer although this same measure for elk, as articulated through Big Game standards 3 and 4a, would not be met under either action alternative. The difference here for mule deer is that there is no numeric threshold since standards 3 and 4a are applicable to elk.

Big Game Standard 4(c) – Winter Range

Forest Plan standard 4(c) (HFP, p. II/18) requires that all winter ranges will be closed to vehicles between December 1 and May 15. See Elk section.

Big Game Standard 8 - Sagebrush

Forest Plan standard 8 (HFP II/19) requires that any proposed sagebrush reduction programs will be analyzed on a case-by-case basis for possible impacts on big game

winter range. There is very little sagebrush in the project area. The action alternatives have been analyzed to determine the impacts of prescribed fire in shrublands and to the extent that it's present, in sagebrush as well. The analysis has indicated that although shrubs will be removed through burning in the short term, in the long term the forage quality of shrubs, including any sagebrush should be improved, and, as such, beneficial to mule deer.

Management Area Direction

There are twelve management areas within the project area and five that have direction relevant to mule deer habitat (direction is in italics).

Management Area W-1

(1) Wildlife habitat improvement practices, including road management, prescribed fire, and other techniques, will be used to maintain and/or enhance the quality of big game and nongame habitat. Roads to be used for the project activities would be managed to minimize effects to mule deer during project implementation. Prescribed fire goals include improving grass and shrublands which would be beneficial to mule deer. Both action alternatives are consistent with this recommendation.

(2) Maintain adequate thermal and hiding cover adjacent to forage areas; this generally means providing at least 25 percent [thermal] cover, where available, on identified winter range. There are 1,412 acres of W-1 in the project area of which 899 are considered winter range. Of that, 187 acres are considered Forest Plan thermal cover which is 21 percent, less than Forest Plan thresholds. The two action alternatives would treat thermal cover on 52 acres in winter range in both alternatives 2 and 3. However, alternative 3 includes more low severity prescribed fire acres than alternative 2 (39 and 6 acres respectively). Because the existing condition is already below Forest Plan thresholds, and because both action alternatives would further reduce thermal cover, a site-specific amendment would be needed to implement either action alternative.

Management Area W-2

(1) Most new roads and about 50 percent of existing roads will be closed, at least seasonally. There are no existing or proposed roads in management area W-2. Therefore this is not applicable.

(2) Wildlife habitat improvement practices, including road management, prescribed fire, and other techniques, will be used to maintain and/or enhance big game calving and summer habitat. The project is designed to avoid calving and nursery areas [and fawning areas to the extent that they are identified]; elsewhere prescribed fire in summer habitat should improve forage conditions for mule deer.

(3) Maintain adequate thermal and hiding cover adjacent to forage areas. Twelve acres of thermal cover would be treated with low severity prescribed fire in alternative 2. There are no treatments in thermal cover in alternative 3. Since low severity prescribed fire is assumed to not reduce thermal cover, the status quo

would be maintained under implementation of alternative 2 and consistency with this standard is retained.

Management Area H-1

Maintain adequate thermal and hiding cover adjacent to forage areas. Generally this means providing at least 25 percent thermal cover, where available, on winter range. The existing thermal cover condition is 31 percent; alternatives 2 and 3 would both result in the treatment of 7 acres of thermal cover with prescribed fire and one acre with precommercial thinning. Because low severity fire is assumed not to reduce thermal cover, and one acre of precommercial thinning is not of significant magnitude to change the percent of thermal cover, both action alternatives would be consistent with this standard.

Management Area H-2

Maintain adequate thermal and hiding cover adjacent to forage areas. Generally this means providing at least 25 percent thermal cover, where available, on winter range. There is no overlap of mule deer winter range with this management area so the standard is not applicable.

Management Area L-2

Maintain adequate thermal and hiding cover adjacent to forage areas. Generally this means providing at least 25 percent thermal cover, where available, on winter range. Approximately 33 percent of the winter range is in thermal cover in this management area. Alternative 2 would result in the treatment of 238 acres of thermal cover of which 181 acres would be with low severity prescribed fire. The remaining acres would be treated with mixed severity prescribed fire which is assumed to remove thermal cover. This would result in a reduction of 8 percent of thermal cover to 25 percent. Alternative 3 would result in the treatment of 204 acres of which 163 acres would be treated with low severity prescribed fire; 41 acres would be treated with mixed severity prescribed fire and shaded fuel breaks. Approximately 27 percent thermal cover would remain. Both action alternatives are consistent with this standard for mule deer winter range.

Management Area T-3

(1) Maintain thermal cover adjacent to forage areas. There are broad parks adjacent to thermal cover in this management area. Treatment effects would vary, from substantial cover reductions associated with improvement cuts to more cover retention in prescribed fire units. Thermal cover would not be retained adjacent to all forage areas in T-3. Therefore a site-specific amendment would be needed to implement either action alternative.

(2) Maintain a minimum of 35 percent hiding cover for big game. There are 211 acres of hiding cover (80 percent) in this management area in the existing condition. Alternative 2 would treat all of those acres; alternative 3 would also treat all 211 acres although 41 of those acres would be treated with precommercial thinning which is designed to retain hiding cover in alternative 3. There would be less than 1 percent and 17 percent hiding cover remaining in alternatives 2 and 3 respectively. A site-specific amendment would be needed to implement either action alternative.

(3) Wildlife habitat improvement practices, including road management, prescribed fire, and other techniques, will be used to maintain and/or enhance the quality of big game summer habitat. The project is designed to improve forage conditions. Prescribed fire goals include improving grass and shrublands as well as promoting open grown forests that are beneficial to mule deer.

(4) Openings created by timber harvest will be reforested to the extent necessary to meet the hiding cover requirements of big game before harvesting adjacent areas. Timber harvest is proposed in T3; however, past timber harvest within T-3 is currently providing hiding cover.

Canada Lynx

Affected Environment

Canada Lynx Biology

Lynx Habitat Use Patterns

Canada Lynx (*Lynx canadensis*) are confined to regions of North America with cold, snowy winters. Core populations are centered in Canada with persistent peripheral populations across the northern tier of the lower 48 states and a patchy southward extension along the Rockies. Lynx inhabit coniferous forests capable of supporting snowshoe hares as a prey base: In North America, the distribution of lynx is nearly coincident with that of snowshoe hares (Ruediger et al. 2000). In the northern Rockies, most lynx occurrence is associated with forests dominated by lodgepole pine, subalpine fir, and Engelmann spruce in the 4900-6550 foot elevation zone. Secondary interspersed vegetation in the Divide landscape includes mid-high elevation Douglas-fir, whitebark pine, and aspen. Dry forest types, such as ponderosa pine and dry Douglas-fir seldom provide suitable lynx habitat (Aubry et al. 1999).

Females establish maternal denning sites in a variety of forest formations ranging from mature and old-growth coniferous forest to young regenerating stands (USDA 2007a, p. 16). In all cases, the key component of lynx den sites appears to be an abundance of coarse woody debris, rather than the age of the forest (Mowat et al. 2000). Middle-aged conifer stands (40-120 years old) with open understories and sparse deadfall do not provide good denning or foraging environments but often serve as travel habitat (Koehler and Aubry 1994).

Lynx usually avoid large unforested areas and prefer to move between primary habitat sites under cover of mature forest, dense early-seral forest, or tall shrubs—typically following ridges or riparian zones and moving through saddles. Based on fieldwork in north-central Washington, Koehler (1990) concluded that openings created by regeneration harvest, where the distance to cover is more than about 325 feet [total opening width of no more than about 650 feet], had potential to divert local lynx movement and preclude other habitat use until forest cover had regrown. On the other hand, research has documented many instances of lynx crossing unforested openings (Roe et al. 2000, cited in USDA 2007b, p. 10). Lynx will move across extensive non-forested areas as needed during dispersal or other long-range excursions (Koehler and Aubry 1994, p. 88; Ruediger et al. 2000, p. 1-12; Aubry et al. 1999, p. 379), although

they prefer to travel through forested habitats or along forest edges (Squires et al. 2013; Ruediger et al. 2000, ch.1 p.4; Mowat et al. 2000). Lynx seldom forage in open habitats, most likely because preferred prey species are uncommon there (Maletzke et al. 2007).

Predator Prey Relationships

Snowshoe hares are the primary prey, making up anywhere from 35 percent to 97 percent of lynx diet. Preferred lynx foraging habitat consists of dense young conifer growth—either in early seral stands or in mature forest understories—that provides cover and browse for hares (Koehler 1990). Koehler and Brittell (1990) recommend that seedling/sapling stands in the lodgepole/subalpine fir zone be well dispersed to provide optimal lynx foraging. Squires (2010) found that in the Seeley Lake region of western Montana, lynx hunted for hares primarily in mature, multi-storied spruce-fir forest in winter and in dense early-seral stands in summer. He cautioned, however, that in southern lynx populations, regional and local habitat differences were likely to generate variations in lynx foraging patterns: a number of southern populations depend primarily on early successional forests year-round, and some inhabit primarily lodgepole pine rather than spruce-fir forests (McKelvey et al. 1999; Aubry et al. 1999, p. 8). These differences are a function of the local availability of key forest types and the distribution of snowshoe hares among them (Maletzke et al. 2007, p. 1473; Squires et al. 2010, p. 1656).

In the mountains of Montana and further south, lynx prey on a wider diversity of species than northern populations because of lower hare densities and the presence of different small mammal communities. Potential alternate prey includes red squirrels, jackrabbits, cottontails, woodrats, marten, marmots, ground squirrels, chipmunks, mice, voles, and grouse (Buskirk et al. 1999b, p. 408-409; Aubry et al. 1999, p. 375-378). Of these, red squirrels are, in most locales, the most important (Ruediger et al. 2000, ch.1 p.8-10; Buskirk et al. 1999b, p. 408-409). Field research indicates that while lynx will opportunistically take advantage of the full array of potential prey species in summer, they focus almost entirely on snowshoe hares in winter whenever they are abundant (Aubry et al. 1999, p. 378).

Lynx Populations

Lynx are highly susceptible to declines in the prey numbers. When hare populations are low, many lynx are unable to raise litters successfully, and in some cases, adults are unable to sustain themselves. As a result, local populations decline (Koehler and Aubry 1994). The other principal natural cause of mortality is conflict with larger carnivores, most notably, mountain lions [Squires (unpublished data, 2010); Buskirk et al. 1999a, p. 89-95]. Among human caused mortality factors, trapping has historically been the primary factor. Heavy trapping throughout the 19th and 20th centuries extirpated lynx from many areas of the Rocky Mountains where they had once been consistently present. Montana set restricted trapping seasons for lynx from 1991-1998 and then suspended trapping after the 1998-1999 season (Ruediger et al. 2000). Lynx are still taken incidentally in traps set for wolves, coyotes, and other large/mid-sized carnivores. Lesser mortality factors in recent decades have included disease, shooting, and roadkill (USDA 2007b, p. 2; Squires and Laurion 1999, p. 10). Human disturbance around den sites,

causing females to move kittens, does not appear to be a source of mortality (Olsen et al. 2011).

Despite this plethora of mortality factors, lynx population numbers in western Montana do not appear to have declined appreciably in recent years: they have increased slightly in some areas, decreased in others. Based on monitoring of 129 lynx over a 10 year period (1998-2007), Squires (unpublished data, 2010) concluded that the lynx population in the Seeley Lake region of west-central Montana has been inching downward while the population in the Purcell Mountains in the northwest corner of the state has been increasing slightly. These are preliminary conclusions, and population data on lynx in the Rocky Mountain region of the U.S. and southern Canada remains sparse and inconclusive. It can be said, however, that these southern lynx populations are substantially smaller than those of the boreal forests of northern Canada and Alaska (because snowshoe hare populations are smaller and more fragmented). On the other hand, southern lynx populations appear to be more stable (Aubry et al. 1999, p. 15-18).

As solitary, wide-ranging predators, lynx in both northern and southern ranges maintain low population densities relative to most other North American carnivores. Home range size varies primarily with the dispersion pattern of suitable habitat, the abundance of prey, lynx population density, and the intensity of trapping (Koehler and Aubry 1994, p. 89-91). In Montana, Brainerd (1985, cited in Koehler and Aubry 1994) has reported home range sizes of about 17 mi² for females and 122 mi² for males. Nellis (1989) concludes that most home ranges fall between 5-20 mi². In northern populations where hares are more abundant, home ranges are typically smaller (Squires and Laurion 1999, p. 347).

Lynx Distribution

Lynx have been documented throughout the mountains of western Montana from the Canadian border into the Yellowstone area. Current distribution of resident animals is disjunct, and a number of areas that support what seem to be extensive blocks of suitable habitat are unoccupied. On the other hand, some localities that appear to have little classic lynx habitat may be supporting small local populations or serving as linkage zones through which lynx move. In 2004-2006, the Colorado Division of Wildlife tracked three of its 218 radio-collared lynx (transplanted into Colorado in the early 2000's) northward into west-central Montana, across the Big Belt Mountain Range on the Helena NF (through very patchy "suitable" habitat), and eventually into Idaho and Wyoming (Ivan 2011; Devineau et al. 2010).

On the Helena NF, the most robust lynx habitat and resident population is in the Blackfoot landscape of the Lincoln Ranger District. Much of the lynx habitat there is a hybrid of the moister conditions in the Seeley Lake region to the northwest and the drier conditions of the Divide landscape to the southeast. The Divide landscape supports a sparse but apparently persistent "population". While some of these animals are probably transients, winter tracking surveys backed by DNA analysis of scat and hair over a 7 year period (2005-2012) indicates that others are long-term residents (Gehman 2006; Gehman et al. 2007-2012; Pilgrim 2009-2012; Pilgrim and Schwartz 2007-2008). Lynx are occasionally reported in the other two landscapes of the Helena NF (the Elkhorns and Big

Belts), but the accounts have been rare and, aside from the radio-collared transients from Colorado, have been difficult to validate.

Lynx Management

Management Direction

The Canada lynx was listed as a threatened species under the Endangered Species Act in 2000. The primary reason for listing was the absence of focused management plans by resource agencies in the northern Rockies. Lynx are now managed via the Northern Rockies Lynx Management Direction (NRLMD) (USDA 2007a, 2007b, 2007c, 2007d), as amended into Forest Plans in the northern Rockies. This management direction is based on the science and recommendations in Ecology and Conservation of Lynx in the United States (Ruggiero et al. 1999), the Lynx Conservation Assessment and Strategy (Ruediger et al. 2000, Interagency Lynx Biology Team 2013), and numerous publications cited in the NRLMD (USDA 2007b, 2007c). Attachment 1 in the Record of Decision for the NRLMD (2007b) displays 13 objectives, 7 standards, and 24 guidelines designed to conserve the lynx. These are divided among 5 categories: all management practices and activities (ALL), vegetation management (VEG), livestock management (GRAZ), human use projects (HU), and linkage areas (LINK).

All four of the standards that address vegetation management are relevant to the current project. Standards VEG S1 and VEG S2 limit the amount of lynx habitat that can be subjected to vegetation management in an LAU within a given time period; standard VEG S5 limits thinning in young conifer stands that provide winter (and summer) snowshoe hare habitat; and standard VEG S6 limits vegetation projects in mature multi-layered stands that provide hare habitat. For the latter two standards, an exception allows for a certain amount of cover loss to fuels management projects in wildland-urban interface (WUI) areas. [VEG S3 and S4, which dealt with denning habitat, were eliminated in the final version of the NRLMD]. Guideline VEG G10 indicates that such fuels projects should be designed with standards VEG S1 and VEG S4 in mind. Also applicable is standard ALL S1, which requires that vegetation management projects maintain habitat connectivity for lynx. The project area is in a linkage area (USDA 2007a), but the three LINK standards/guidelines focus on land ownership, highways, and livestock grazing, and none are directly applicable to the project. Finally, HU G9 directs that roads be gated to public vehicle use during project operations and that they be decommissioned or obliterated at project's end.

Lynx Analysis Units (LAUs)

The basic units for analyzing the effects of management actions on lynx are lynx analysis units (LAUs)—areas about the size of individual female lynx home ranges. The rationale for defining units on this scale is discussed in the Canada Lynx Conservation Assessment and Strategy (Ruediger et al. 2000, p. 7-2). Biologists on the Helena NF delineated 29 LAUs in 2000, six of which fall within the Divide landscape. Divide LAUs are designated di-01 through di-06 and average 34,920 acres in size.

The Tenmile – South Helena project area includes large portions of di-05 and di-06, and a small portion of di-04 along the projects western border. This analysis will look at all 3

of these LAU's—although greater than 90 percent of the project area is covered by LAU di-05 and di-06.

Delineating Lynx Habitat

Most objectives, standards, and guidelines in the Lynx Management Direction apply only to designated lynx habitat within LAUs on National Forest System lands (NRLMD, Attachment 1, p. 1-6). The Helena NF delineates lynx habitat based on information in the habitat types layer of the database and satellite imagery (the Region 1 VMAP database). Basically, “potential lynx habitat” (generally referred to simply as “lynx habitat”) consists of cool, moist coniferous forest habitat types—in any stage of development—on Helena National Forest land above 5,500 ft. These are environments in the Divide landscape that we feel are likely to support habitat components that can retain lynx or that can be expected to develop such characteristics over time. Table 100 displays the acreage of lynx habitat within the 3 LAUs.

Table 100. Lynx analysis units (LAUs) that overlap or lie adjacent to the Tenmile - South Helena project area.

LAU	LAU Location	Ownership	LAU Total Acres	Acres of Lynx Habitat	% Lynx Habitat
di-04	Telegraph – Ontario Creeks	USFS	25,831	18,755	73 %
		Private	2,347	1,088	46%
		TOTAL	28,178	19,843	70 %
di-05	Upper Tenmile Creek	USFS	30,896	13,350	43 %
		Private	5,652	3,076	54%
		TOTAL	36,548	16,426	45%
di-06	South Helena – Quartz Creek	USFS	38,872	10,661	27%
		Private	7,485	1,183	16%
		City	138	0	0%
		TOTAL	46,494	11,844	26 %
Combined			111,220	48,113	43%

LAU di-06 incorporates open grassland habitat. Both LAUs di-05 and di-06 include a considerable amount of dry forest (mostly in their northern, lower elevation reaches), and thus support less potential lynx habitat than LAU di-04, which is dominated by moist forested habitat types. LAU di-05 also includes substantial areas of talus and other lightly forested rocky slopes that will not develop into lynx habitat.

Within potential lynx habitat, the Helena National Forest [drawing on the NRLMD (USDA 2007b, p. 11-14)] identifies functional snowshoe hare habitat as the key component. Year-round snowshoe hare habitat consists of thickets of young conifers that can provide abundant browse, hiding cover, and enough overhead structure to create under-snow shelter and feeding areas. These conditions occur either in (1) early seral stands that are regenerating after timber harvest, fire, or other stand-replacing phenomena (stand initiation structural stages) or (2) in the understories of mature multi-layered forests (multistoried structural stages) with dense undergrowth. In both cases, the young conifers need to be tall enough to protrude above the snow and have boughs low enough to touch the snow surface. The rationale for focusing on these aspects of the habitat is

discussed In the NRLMD ROD (USDA 2007b, p. 8-14). In most Divide LAUs, roughly one-third of “potential” habitat currently supports vegetation structure that can support snowshoe hares in winter [27 to 43 percent in LAUs di-04, di-05, and di-06 (Table 100)].

In LAU di-04 there have been no fires of any size recorded, and, as a result, vegetation structure is dominated by mature conifer forest. LAU di-04 has a considerable amount of regeneration timber harvest from the late 1960s through the early 1990s and thus supports a robust matrix of mature forest and early seral forest (consisting mostly of conifer saplings). In LAU di-05, 772 acres burned in 1990 in lynx habitat. There has been little timber harvest in LAU di-05, which covers the Helena municipal watershed in upper Tenmile Creek, and its forest habitat types remain mostly as mature forest. Fires in LAU di-06 occurred at lower elevations, primarily in areas that do not provide lynx habitat. There are recent timber harvest activities in LAU di-06 on small acreages of lynx habitat, and habitat is a mix of mature and early seral forest. A majority of the mature forest in these LAUs is dominated by lodgepole pine, now dead from mountain pine beetle infestation.

Delineating Occupied Habitat

The Lynx Management Direction applies to National Forest lands “occupied” by lynx [NRLMD ROD (USDA 2007a; 2007b, Attachment 1, p. 1)]. On the Helena NF, the Blackfoot and Divide landscapes—both of which support resident lynx—are considered “occupied”. In the Divide landscape, areas north of U.S. Highway 12 are categorized as “core” occupied habitat and those south of the highway as “secondary” occupied habitat [Northern Rockies Lynx Planning Area Map (USDA 2007a)]. Preliminary objectives for “secondary” habitat areas are a bit different from those for “core” areas (USDA 2007c, p. 3-4), but we apply NRLMD standards and guidelines to both areas in the same way. The Tenmile – South Helena project area lies within the secondary occupied habitat area.

Critical Lynx Habitat

The U.S. Fish and Wildlife Service (USFWS) Final Rule (50 CFR Part 17) designating “critical” habitat for lynx in the contiguous U.S. (Federal Register, Vol. 74, No. 36, Feb. 25, 2009) has been in effect since March 2009. In 2014, USFWS published a revised designation of critical habitat (Federal Register, Vol. 79, No. 177, Sep. 12, 2014). The revised rule did not change any designation on the Helena National Forest. The critical habitat designation is based on field research and professional opinion. The Northern Rocky Mountains (Unit 3) area of designated critical habitat is 9,783 square miles. On the Helena NF it includes the entire Blackfoot landscape (Lincoln Ranger District) and the northern half of the Divide landscape (north of U.S. Highway 12)—essentially the same area shown as “core lynx habitat” on the 2007 Lynx Planning Area Map (USDA 2007a Figure 5). Critical habitat includes all National Forest land: the previously designated areas of “occupied core lynx habitat” plus the entire surrounding and intervening non-lynx habitat—“matrix habitat” that may provide linkage. It is not limited to “potential lynx habitat.” The Tenmile – South Helena project area is not designated critical habitat.

In addition to designating critical habitat, the Final Rule identifies “physical and biological features that are essential to the conservation” of lynx: that is, “primary constituent elements” (PCEs). The overarching PCE for lynx critical habitat consists of

“boreal forest landscapes supporting a mosaic of differing successional forest stages”. These landscapes contain (a) snowshoe hares and their “preferred habitat conditions, which include dense understories of young trees, shrubs, or overhanging boughs that protrude above the snow, and mature multi-storied stands with conifer boughs touching the snow surface”; (b) “winter conditions that provide and maintain deep, fluffy snow for extended periods of time”; (c) “sites for denning that have abundant coarse woody debris, such as downed trees and root wads”; and (d) matrix habitat (not supporting hares) “that occurs between patches of boreal forest in close juxtaposition (at the scale of a lynx home range) such that lynx are likely to travel through such habitat while accessing patches of boreal forest within a home range” (Fed. Register, Vol. 74, No. 36, p. 8638).

At this point, the Helena NF, knowing that lynx are in fact resident in the “non-critical” habitat zone south of Highway 12, applies the standards and guidelines of the NRLMD to all areas of the Divide landscape. The PCE guidance, however, does not currently apply to the region south of Highway 12. The project area, while in “occupied” lynx habitat, is not in “critical” lynx habitat. PCE guidance does apply to the northern end of LAU di-05, however, which extends north of Highway 12 to take in the Sweeney Creek and Little Porcupine Creek drainages.

Lynx Habitat and Population Status in the Project Area

Habitat in Local LAUs

Table 101 and Table 102 below display the acreage and percentage of stand initiation and mature multi-storied snowshoe hare habitat in the three LAUs that include or lie adjacent to the project area. While most NRLMD guidance applies to management of lynx habitat on Federal land, Table 101 and Table 102 provide an estimate of hare habitat on all public and private lands within Helena NF administrative boundaries. The data for non-forest land is relevant to NRLMD standard VEG S1, discussed in the “Environmental Consequences” section.

Table 101. Current acres of snowshoe hare habitat and the percent of habitat in the three local lynx analysis units. “Multi-storied hare habitat”, “early stand-initiation habitat” and “stand-initiation hare habitat” are the three habitat categories used to determine compliance with NRLMD standards VEG S5 and VEG S6. “Non-Forest acres” include all private and State land within Helena NF administrative boundaries.

Snowshoe Hare/Lynx Habitat		LAU di-04	LAU di-05	LAU di-06	Area Total
Multi-Storied Hare Habitat (Winter & Summer Forage)	Helena NF Acres	5,964	3,576	3,811	13,351
	Non-Forest Acres	412	676	588	1,676
	Total Acres	6,376	4,253	4,399	15,027
	% of Lynx Habitat	32%	26%	37%	31%
Stand-Initiation Hare Habitat (Winter & Summer Forage)	Helena NF Acres	1,982	198	687	2,867
	Non-Forest Acres	64	63	12	139
	Total Acres	2,046	261	699	3,006
	% of Lynx Habitat	10%	2%	6%	6%
Early Stand-Initiation Habitat (Summer Forage Only)	Helena NF Acres	594	204	137	935
	Non-Forest Acres	81	215	24	320
	Total Acres	675	419	161	1,255
	% of Lynx Habitat	3%	3 %	1%	3%
Other Forest Habitat ¹ (Not Currently Hare Habitat)	Helena NF Acres	10,215	9,372	6,026	25,613
	Non-Forest Acres	532	2,122	560	3,214
	Total Acres	10,746	11,494	6,586	28,827
	% of Lynx Habitat	54%	70%	56%	60%
Total Potential Lynx Habitat		19,843	16,426	11,844	48,113
¹ “Other Forest Habitat” is any post-stand initiation habitat structure unable to support hares: (1) dense pole or larger self-pruned sapling stands (“stem exclusion stages”), (2) mid-seral stands with poorly developed understory structure, or (2) mature stands with poorly developed understory structure [Error! Reference source not found.].					

As seen in Table 101, potential lynx habitat accounts for approximately 70 percent of LAU di-04, 45 percent of LAU di-05, and 25 percent of LAU di-06. These are habitat types capable of producing the kind of environments in which lynx can den, find cover, and, above all, successfully forage for snowshoe hares. This amounts to a total of 48,113 acres of potential habitat in the 3 LAUs (42,765 acres on National Forest land). As Table 102 shows, 28 percent to 43 percent of the LAUs have achieved the stand structure that the NRLMD indicates will sustain hares and lynx year-round [the top 2 rows in Table 101]. Note that a large proportion of the functioning hare habitat (31 percent) is in mature, multi-storied stands. Stand initiation formations account for only 6 percent of hare habitat.

While hare habitat is well-distributed throughout potential lynx habitat across all 3 LAUs, it is highly fragmented. The first two rows of Table 101 indicate that functional snowshoe hare habitat is more abundant and represents a larger proportion of the landscape in LAUs di-04 and di-06 than in LAU di-05. In LAUs di-04 and di-06 the larger blocks of contiguous habitat are formed by the stand-initiation habitat surrounded by multi-storied stands. In di-05 hare habitat is more limited and consists of scattered multi-storied stands primarily in the southern portion of the LAU.

Lynx Occurrence in the Divide Landscape and Project Area

The Helena NF wildlife database shows 12 observations (or groups of observations) of lynx or lynx tracks in the six Divide landscape LAUs since 1999 that have been verified or are considered highly credible (by MFWP and/or Helena NF biologists). These include an adult lynx photographed in a tree in Hahn Creek in 2006 and a juvenile female killed on Highway 12 west of MacDonald Pass in 2003. Other reports have come from these areas, but their credibility is unclear (Helena NF wildlife observation files).

In addition to these fortuitous observations, data is available from systematic tracking surveys conducted by MFWP along the Continental Divide between Boulder River in the south and Bullion Parks/ Jericho Mountain in the north [B. Giddings, personal communication; Helena NF wildlife observation files]. Most lynx tracks encountered in these surveys over the past 15 years have been in the Boulder River drainage a few miles south and east of the Helena NF boundary. But some are from the Continental Divide trail (CDNST) where it runs along the Helena / Beaverhead-Deerlodge NF boundary.

From 2007 through 2010, Wild Things Unlimited of Bozeman, Montana ran winter track surveys over a wide area north and south of MacDonald Pass. The surveys identified several carnivores, but the primary targets were wolverines and lynx. Much of the fieldwork was done in the upper Little Blackfoot and Telegraph Creek drainages south of the pass, but areas along the Divide toward Greenhorn Mountain and in the upper Tenmile drainage were surveyed as well. Fieldworkers went wherever the tracks led. Surveys involved systematic back-tracking and collection of hair, scat, and urine samples, which were then sent to the USFS Rocky Mountain Research Station in Missoula for DNA analysis [see Gehman 2006; Gehman et al. 2007-2010; Pilgrim 2009-2010; Pilgrim and Schwartz 2007-2008]. DNA analysis allows identification of species and individual animals. Since 2010, surveyors have continued to check in on the area each winter, but the bulk of the tracking effort has now shifted to the Lincoln RD to the north.

Habitat in the Project Area

The Tenmile – South Helena project area (61,395 acres) occupies much the same ground as LAU di-05 and over half of LAU di-06. A small portion of LAU di-04 is included in the project area along its western boundary. The project area includes 168 acres (0.6 percent) of LAU di-04, 30,660 acres (84 percent) of LAU di-05, and 29,524 acres (64 percent) of LAU di-06. Table 102 displays the lynx habitat within the project area by LAU.

Table 102. Lynx habitat within the Tenmile–South Helena project area by LAU.

Snowshoe Hare / Lynx Habitat		LAU di-04	LAU di-05	LAU di-06	Area Total
Multi-Storied Hare Habitat (Winter & Summer Forage)	Helena NF Acres	15	2,811	1,043	3,869
	Non-Forest Acres	0	670	77	747
	Total Acres	15	3,481	1,120	4,616
	% of LAU in project area % of Multi-Storied Habitat in entire LAU	9% <1 %	11% 82%	4% 26%	8% 31%
Stand-Initiation Hare Habitat (Winter & Summer Forage)	Helena NF Acres	0	118	246	364
	Non-Forest Acres	0	63	12	75
	Total Acres	0	181	258	439
	% of LAU in project area % of Stand Initiation Habitat in entire LAU	0% 0%	1% 70%	1% 37%	<1% 15%
Early Stand-Initiation Habitat (Summer Forage Only)	Helena NF Acres	0	128	27	155
	Non-Forest Acres	0	211	6	217
	Total Acres	0	339	32	371
	% of LAU in project area % of Early Stand Initiation Habitat in entire LAU	0% 0%	1% 81%	<1% 20%	<1% 30%
Other Forest Habitat ¹ (Not Currently Hare Habitat)	Helena NF Acres	47	8,823	1,432	10,302
	Non-Forest Acres	0	2,097	31	2,128
	Total Acres	47	10,920	1,463	12,430
	% of LAU in project area % of Other Forest Habitat in entire LAU	27% <1%	37% 95%	5% 22%	21% 43%
Total Potential Lynx Habitat In Project Area Compared with Total Lynx Habitat in the LAU		62 (<1%)	14,921 (91%)	2,873 (24%)	17,856 (37%)
¹ “Other Forest Habitat” is any post-stand initiation habitat structure unable to support hares: (1) dense pole or larger self-pruned sapling stands (“stem exclusion stages”), (2) mid-seral stands with poorly developed understory structure, or (2) mature stands with poorly developed understory structure [Error! Reference source not found.].					

About 37 percent of the project area qualifies as potential lynx habitat, and 5,055 acres of the potential habitat is structurally capable of providing year-round snowshoe hare habitat. Of the functioning hare habitat, only 9 percent of it is in a stand initiation stage and about 91 percent is multi-storied mature forest.



Figure 65. A mature lodgepole pine stand near Chessman Reservoir. This is typical of a majority of mature forests in the project area—a relatively dense overstory (prior to beetle-kill) with little regeneration emerging in the understory. This is “potential lynx habitat”, but in its current configuration it does not provide winter habitat for snowshoe hares and thus is not considered viable lynx winter foraging habitat.

Figure 65 and Figure 66 illustrate the kinds of habitats where lynx have been located in the greater Tennile – South Helena project area in winter and in which they have been able to successfully forage for snowshoe hares. These habitats, while marginal by standards applied to moist westside and more northerly Forests, have been sufficient to support a modest population of snowshoe hares in winter. Lynx have been able to inhabit this area by taking advantage of these hares as well as red squirrels, and carrion remains of local ungulates (Gehman et al. 2010). Over the past several years, lynx have spent much of the winter in areas such as those depicted in these photos.



Figure 66. Multi-storied mature forest in Minnehaha Creek just east of the Continental Divide. These forests provide winter habitat for snowshoe hares, and lynx have been documented using this area during the winter.



Figure 67. A small wet meadow, with deciduous shrubs and dense conifers along the fringe, in the headwaters of Walker Creek. Lynx have been documented to the west in the Mike Renig drainage in similar environs; given their home range it's likely that lynx are making use of these areas.

Environmental Consequences

The following measures are used to analyze effects to lynx:

- Effects to early stand initiation habitat
- Effects to stand initiation hare habitat
- Effects to multistory hare habitat
- Effects to denning habitat (large downed wood)
- Effects to linkage areas

- Desirable Habitat Conditions
- √ Early successional habitats that provide dense clumps of young conifers dominate
 - √ Multistory habitats that provide snowshoe hare habitat

Effects Common to All Alternatives

Under all alternatives natural process would proceed as described in the Forest Vegetation Report. In areas where mountain pine beetle (MPB) impacted the stand, snags have increased and have begun to fall thereby increasing the levels of downed wood. Increased levels of large down wood would provide an increase in lynx denning habitat. However, MPB activity has also reduced the amount of mature forest habitat in the analysis area. The increase in fuel loading and increased risk of stand replacing fire into the future increases the likelihood of loss of lynx habitat.

Effects Common to All Action Alternatives

Proposed treatments are described in full in Chapter 2. Treatment types include low and mixed severity prescribed fire, low severity grassland prescribed fire, private land buffers, improvement harvest, shaded fuel break, precommercial thinning, and regeneration harvest. Low severity prescribed fire and low severity grassland prescribed fire would result in the loss of some low growing vegetation and consumption of downed wood within treated areas; however these changes would not appreciably alter lynx habitat in the treated areas. Mixed severity prescribed fire, private land buffers, improvement harvest, shaded fuel break and precommercial thinning treatments remove some vegetation and leave some. The result of treatment depends on the existing lynx habitat structural stage. For example, precommercial thinning in stem exclusion structural stage would maintain the stem exclusion structural stage, while the same treatment in stand initiation structural stage would convert the treated area to stem exclusion structural stage. Regeneration harvest would result in all structural stages becoming early stand initiation. Table 103 displays the anticipated lynx habitat structural stage post treatment based on the existing structural stage and the proposed treatment. Specifics of acres altered are discussed by alternative.

Table 103. Resultant lynx habitat structural stage post treatment.

Proposed Treatment	Existing Lynx Habitat Structural Stage				
	Early stand initiation	Stand initiation	Stem exclusion ¹	Other ²	Multi-storied
Low severity prescribed fire	Early stand initiation	Stand initiation	Stem exclusion	Other	Multi-storied
Low severity grassland prescribed fire	Early stand initiation	Stand initiation	Stem exclusion	Other	Multi-storied
Mixed severity prescribed fire	Early stand initiation	Stand initiation and early stand initiation	Stem exclusion and early stand initiation	Other and early stand initiation	Multi-storied, other, and early stand initiation
Private land buffers	Early stand initiation	Other	Other	Other	Other
Improvement harvest	Early stand initiation	Other	Other	Other	Other
Precommercial thin	Early stand initiation	Stand initiation	Other	Other	Other
Shaded fuel break	Early stand initiation	Other	Other	Other	Other
Regeneration harvest	Early stand initiation	Early stand initiation	Early stand initiation	Early stand initiation	Early stand initiation
¹ Stem Exclusion structural stage occurs when trees initially grow fast and quickly occupy all of the growing space, creating a closed canopy with limited understory.					
² “Other” includes mid-seral or mature stands with poorly developed understory structure.					

Alternative 1

Direct/Indirect Effects

Under Alternative 1 there would be no action taken. Natural process would proceed as described in the Forest Vegetation Report. The current distribution of age classes, species mixes, and within-stand and across-landscape structural complexity would be maintained in the short term. The sustained homogeneity of age/size class and the extent of high amounts of downed woody fuels may result in conditions susceptible to landscape level disturbances. At higher elevations, where lynx habitat mostly occurs, a shift from whitebark pine to spruce and fir forests is predicted. Lynx habitat would remain as shown in Table 104. Early stand initiation structural stage is present on a small number of acres in each LAU. This stage develops into stand initiation, or winter snowshoe hare habitat, in approximately 15 to 20 years from time of disturbance. There would be little recruitment of stand initiation habitat under Alternative 1, leaving both LAUs di-05 and di-06 with low quantities of this habitat. Multistoried hare habitat occurs on one quarter to one third of the analyzed LAUs. According to the Forest Vegetation Report, over time there would be an increase in multistoried stands as the area recovers from the MPB disturbance, thereby increasing multistoried hare habitat.

Lynx denning habitat is provided in mature stands with adequate large downed wood to provide den sites. One quarter to one third of each LAU currently contains multistoried lynx habitat. Estimates of snags in the Divide Landscape are approximately 10 snags per acre in the 12-19.9 inch size class, and very few snags greater than 20 inches in diameter.

These snags have already begun to fall, thereby creating adequate downed wood for denning. There will be a short term increase in large downed wood recruitment as the snags continue to fall over the next decade. Because of the reduction in mature green trees caused by MPB, there will be a long term decrease in large downed wood recruitment until trees mature and are killed by natural causes or change agents (like MPB).

Over half of each of the LAUs would remain in the ‘other’ and stem exclusion structural stages, areas that provide for habitat connectivity and movement of lynx, but do not generally provide foraging habitat or habitat for snowshoe hare. Openings created by MPB activity could impede movement of lynx; however, adequate habitat remains for movement within the LAUs, between the LAUs, and to the core habitat to the north across Highway 12.

No Action Alternative Cumulative Effects

While there can be no cumulative effect from no action being taken, a discussion of the likely trajectory of the lynx habitat in the project area may prove beneficial.

Appendix E of the Wildlife Report includes information for the cumulative effects analysis, including tables of the past, present and reasonably foreseeable actions. Table 1 of Appendix E in the Wildlife Report lists the past vegetative and fuels activities that shaped the existing condition. The existing lynx habitat used in the analysis was developed from VMap 2014, which included past activities through 2010. From 2011 to 2015 there were an additional 435 acres of vegetation treatment within lynx habitat in LAU di-05 and 33 acres in LAU di-06 which modified the existing condition. These vegetation treatments include portions of Red Mountain Flume Chessman Reservoir, MacDonald Pass Hazard Tree Removal, North Divide Roadside Hazard Removal, Rimini County Roadside Hazard Removal, and smaller projects. These projects included a number of treatments (fuel break, sanitation, improvement, regeneration) with different effects on lynx habitat. In particular, in LAU di-05 there is an increase of 118 acres of early stand initiation habitat, a loss of 10 acres of multi-storied habitat, and openings were created on 108 acres of ‘other’ and stem exclusion habitat that provides connectivity. Most of these openings occur in narrow strips and would not likely impede lynx movement in the LAU. In LAU di-06 there is an increase in 29 acres of early stand initiation habitat, a loss of 2 acres of multi-storied habitat, and an increase in 27 acres of openings in narrow strips in connecting habitat. These differences do not alter the percent of existing habitat in each LAU to the extent that is meaningful to lynx use of the area.

Table E-2 of Appendix E in the Wildlife Report lists other types of past projects. None of these projects changed lynx habitat in the analysis area, although they would have contributed to disturbance of lynx. Table 263 (of the DEIS) lists the present/ongoing projects. The Red Mountain Flume Chessman Reservoir Project and Clancy Unionville Vegetation Projects are partially complete with fuel treatments still being implemented. Changes to lynx habitat are discussed in the preceding paragraph. The remaining ongoing activities primarily result in disturbance effects to lynx in localized areas. As these activities have occurred over extended time periods, it is likely lynx have adapted to the disturbance effects.

Table E-4 of Appendix E in the Wildlife Report lists the reasonably foreseeable activities in the analysis area. Disturbance during project implementation is the primary effect of the Golden Anchor Road, Tenmile Road Improvement Project, Rimini Substation, and Minerals Operations. The East Deerlodge Valley Landscape Restoration Management Project does not fall within the LAUs considered here. The Telegraph Creek MPB Salvage and Precommercial Thinning Project includes much of LAU di-04. For this cumulative effects analysis, alternative 2 of the proposed Telegraph Project is analyzed since it's the most aggressive in terms of acres treated. In LAU di-04, the Telegraph project would treat about 4,645 acres of lynx habitat.

Alternative 1 of the Tenmile – South Helena Vegetation Project proposes no treatments. The natural changes to lynx habitat under alternative 1 would be cumulative to the changes described here. These changes are not expected to cumulatively have an effect on lynx or its habitat.

Alternatives 2 and 3

Direct/Indirect Effects

Under alternative 2 there would be approximately 62 acres of lynx habitat treated in LAU di-04 (less than 1 percent of total lynx habitat in the LAU), 4,529 acres of treatment in LAU di-05 (28 percent), and 722 acres of treatment in LAU di-06 (6 percent) (). In LAU di-04, the proposed treatment consists of shaded fuel break on the ridge that is on the eastern edge of the LAU. In LAU di-05, the majority of the proposed treatment is regeneration harvest (41 percent), followed by low severity prescribed fire (29 percent) and private land buffers (13 percent). There are small acreages of mixed severity prescribed fire, improvement harvest, shaded fuel break, and precommercial thinning within LAU di-05. In LAU di-06, the majority of the proposed treatment is regeneration harvest (47 percent), followed by low severity prescribed fire (33 percent). There are small acreages of mixed severity prescribed fire, private land buffers, improvement harvest, shaded fuel break, and precommercial thinning within LAU di-06.

Table 104 displays the changes to lynx habitat under alternative 2. Early stand initiation structural stage increases by almost 2,000 acres in LAU di-05 and by over 300 acres in LAU di-06. This change increases the early stand initiation habitat by over 5-fold in the analysis area. In approximately 15 to 20 years, these acres would be available as stand initiation structural stage hare habitat. Stand initiation hare habitat is slightly reduced in the short term under alternative 2; however the change occurs in small patches on less than 1 percent of the total lynx habitat available in LAUs di-05 and di-06. The long term increase in stand initiation habitat would provide more foraging habitat for lynx in a landscape where foraging habitat is currently limited. Multistoried hare habitat would slightly decrease in LAUs di-04 and di-06 under alternative 2, with just over 600 acres removed from LAU di-05. These changes do not alter the percentages of lynx habitat in multistoried habitat appreciably, with just under a 4 percent change in LAU di-05. This loss of multi-storied habitat would slightly decrease hare habitat in the short term, potentially reducing the availability of snowshoe hare in localized areas in LAU di-05. Because of the large home range size of individual lynx and the amount of hare habitat remaining, this slight reduction is not expected to result in adverse effects to lynx survival or reproduction in the short term. In the long term, hare habitat would increase

across the analysis area which may lead to increased survivability of lynx in the area and/or potentially successful lynx reproduction in years of high hare availability.

Under alternative 2 potential denning habitat would be reduced by removal of multi-storied habitat as described above. In addition, downed wood recruitment in the short term would be less than that under alternative 1 in areas where snags are removed from the landscape by proposed treatments. Because a large percentage of the LAUs would maintain multi-storied habitat with increased downed wood recruitment, denning habitat would still increase in the analysis area in the short term. In the mid to long term, as existing downed wood decomposes, denning habitat would decrease as fewer large downed logs would be recruited on the landscape. In the long term, as trees mature and once again begin to die from natural causes, denning habitat would again increase on the landscape.

Although alternative 2 would result in a reduction in the amount of ‘other forest habitat’, over half of each of the LAUs would remain in these structural stages. Proposed regeneration harvest would create openings in this habitat. Some of these openings are fairly large and lynx tend to avoid large openings (Squires et al. 2010). Within the LAUs, adequate forested habitat remains to allow movement. There is also adequate habitat connectivity to allow lynx to move between LAU di-05 and LAU di-06, and for lynx to move north in LAU di-05 into the core habitat across Highway 12 and into LAU di-02 (not mapped). Proposed regeneration harvest along the ridge between LAU di-05 and LAU di-04 creates a corridor of openings that may limit movement between these two LAUs along their southern boundary. The opening varies in width from 300 to 1000 feet. If lynx do not cross in this area there is adequate habitat connecting the two LAUs further north along their boundary. Lynx would expend greater energy to move between the LAUs after the proposed regeneration harvest occurs.

Proposed activities in LAUs di-04, di-05 and di-06 would result in disturbance to lynx during project implementation. Implementation is likely to conclude within five to ten years of a decision. In LAU di-04 disturbance would be minimal, as activities occur on few acres and lynx in the LAU could avoid implementation activities. In LAU di-06 most of the proposed activities occur outside of lynx habitat and again disturbance would be expected to be minimal. Proposed activities in LAU di-05 are more widespread within existing lynx habitat, and would result in altered use patterns by lynx in the project area.

Table 104. Acres and percentages of lynx habitat remaining by structural stage for each of the Tenmile – South Helena alternatives by LAU.

Snowshoe Hare / Lynx Habitat		LAU di-04	LAU di-05	LAU di-06	Area Total
Multi-Storied Hare Habitat (Winter & Summer Forage)	Alternative 1 (existing)	6,376 (32%)	4,253 (26%)	4,399(37%)	15,027
	Alternative 2	6,361 (32%)	3,627 (22%)	4,307 (36%)	14,295
	Alternative 3	6,361 (32%)	3,692 (23%)	4,346 (37%)	14,399
Stand-Initiation Hare Habitat (Winter & Summer Forage)	Alternative 1 (existing)	2,046 (10%)	261 (2%)	699 (6%)	3,006
	Alternative 2	2,046 (10%)	191 (1%)	678 (6%)	2,915
	Alternative 3	2,046 (10%)	197 (1%)	685 (6%)	2,928
Early Stand-Initiation Habitat (Summer Forage Only)	Alternative 1 (existing)	675 (3%)	419 (3%)	161 (1%)	1,254
	Alternative 2	675 (3%)	2,358 (14%)	497 (4%)	3,530
	Alternative 3	675 (3%)	1,874 (11%)	175 (2%)	2,724
Other Forest Habitat* (Not Currently Hare Habitat)	Alternative 1 (existing)	10,746 (54%)	11,494 (70%)	6,586 (56%)	28,825
	Alternative 2	10,761 (54%)	10,250 (62%)	6,489 (55%)	27,500
	Alternative 3	10,761 (54%)	10,663 (65%)	6,639 (56%)	28,063
Total Potential Lynx Habitat		19,843	16,426	11,844	48,113
**“Other Forest Habitat” is any post-stand initiation habitat structure unable to support hares: (1) dense pole or larger self-pruned sapling stands (“stem exclusion stages”), (2) mid-seral stands with poorly developed understory structure, or (2) mature stands with poorly developed understory structure .					

Under alternative 3 there would be approximately 46 acres of lynx habitat treated in LAU di-04 (less than 1%), 3,011 acres of treatment in LAU di-05 (18 percent), and 182 acres of treatment in LAU di-06 (2 percent) (Table 104). In LAU di-04, the proposed treatment again consists of shaded fuel breaks. In LAU di-05, the majority of the proposed treatment is regeneration harvest (47 percent), followed by private land buffers (20 percent) and low severity prescribed fire (14 percent). There are small acreages of low severity grassland prescribed fire, mixed severity prescribed fire, improvement harvest, shaded fuel break, and precommercial thinning within LAU di-05. In LAU di-06, the majority of the proposed treatment is private land buffers (39 percent), followed by precommercial thinning (24 percent) and low severity prescribed fire (15 percent). There are small acreages of low severity grassland prescribed fire, improvement harvest, shaded fuel break, and regeneration harvest within LAU di-06.

Table 104 displays the changes to lynx habitat under alternative 3. In general, effects are similar to alternative 2 but differ in extent and magnitude. Early stand initiation structural stage increases by approximately 1,500 acres in LAU di-05 and by 14 acres in LAU di-06. This change increases the early stand initiation habitat by over 100 percent overall in the three LAUs combined. In approximately 15-20 years, these acres would be available as stand initiation structural stage hare habitat. Stand initiation hare habitat is reduced in the short term under Alternative 3 to a slightly lesser extent than alternative 2 (approximately 15 acres less). The change occurs in small patches on less than 1 percent of the total lynx habitat available in LAUs di-05 and di-06. The long term increase in stand initiation habitat would provide more foraging habitat for lynx in a landscape where

foraging habitat is currently limited. Multistoried hare habitat would slightly decrease in LAUs di-04 and di-06 under alternative 3, with just over 560 acres removed from LAU di-05. These changes do not alter the percentages of lynx habitat in multistoried habitat appreciably, with just over a 3 percent change in LAU di-05. This loss of multi-storied habitat would slightly decrease hare habitat in the short term, potentially reducing the availability of snowshoe hare in localized areas in LAU di-05. Because of the large home range size of individual lynx and the amount of hare habitat remaining, this slight reduction is not expected to result in adverse effects to lynx survival or reproduction in the short term. In the long term, hare habitat would be increased across the analysis area which may lead to increased lynx survivability in the area and/or potentially successful lynx reproduction in years of high hare availability.

Under alternative 3 potential denning habitat would be reduced by removal of multi-storied habitat as described above. In addition, downed wood recruitment in the short term would be less than under alternative 1 in areas where snags are removed from the landscape by proposed treatments. Because a large percentage of the LAUs would maintain multi-storied habitat with increased downed wood recruitment, denning habitat would still increase in the analysis area in the short term. In the mid to long term, as existing downed wood decomposes denning habitat would decrease as fewer large downed logs would be recruited on the landscape. In the long term, as trees mature and once again begin to die from natural causes, denning habitat would again increase on the landscape.

Alternative 3 would result in an increase in the amount of 'other forest habitat' in LAUs di-04 and di-06, and a decrease in the amount in LAU di-05. Over half of each of the LAUs would remain in the 'other forest habitat'. Proposed regeneration harvest would create openings in this habitat. Some of these openings are fairly large and lynx tend to avoid entering those (Squires et al. 2010). In particular there is an opening created in the southern portion of LAU di-05 (unit 18, 395 acres) that is much larger than the opening created under alternative 2 (unit 18 - 134 acres). Within the LAUs, adequate forested habitat remains to allow movement around the openings. There is also adequate linkage habitat to allow lynx to move between all three LAUs, as less habitat is proposed for regeneration along the ridge between LAUs di-04 and di-05. Habitat is maintained for movement to the north in LAU di-05 into the core habitat across Highway 12 and into LAU di-02 (not mapped).

Proposed activities in LAUs di-04, di-05 and di-06 would result in disturbance to lynx during project implementation. Implementation is likely to conclude within five to ten years of a decision. In LAU di-04 disturbance would be minimal, as activities occur on few acres and lynx in the LAU could avoid implementation activities. In LAU di-06 most of the proposed activities occur outside of lynx habitat, and again disturbance would be expected to be minimal. Proposed activities in LAU di-05 are more widespread within existing lynx habitat, and would result in altered use patterns by lynx in the project area.

Action Alternatives Cumulative Effects

Cumulative effects are the incremental impacts that the direct and indirect effects associated with the action alternatives have on lynx habitat in the context of the myriad of other past, present, and future effects on lynx habitat from unrelated activities. The

cumulative effects analysis considers spatial and temporal boundaries, how past activities have contributed to the existing condition, and whether the ecosystem can accommodate additional effects. Table 105 summarizes the key items that are taken into consideration for the cumulative effects analysis for lynx habitat. See also DEIS - Appendix C, Cumulative Effects, for more information.

Table 105. Cumulative effects considerations for lynx habitat

Parameter	Discussion
Spatial Boundary	The spatial boundary needs to be expanded to the point at which lynx habitat is no longer measurably affected. The respective LAU satisfies this requirement because this is the scale at which the effects to lynx can be examined at the stand or treatment unit. The LAU boundary also provides a sufficient landscape to assess pattern and structure in the context of larger processes.
Temporal Boundary	The temporal boundary ranges from the 1960s (due to a lack of earlier records in the FACTS database) to those future projects that are either listed in our SOPA or are planned or implemented on private land within the project boundary.
Past Activities and Existing Condition	The effects of past activities are reflected in the existing condition. Past activities shaped the vegetative and species composition of lynx habitat that comprise the project area today. The existing condition, which incorporates the changes due to past activities, has been measured by remote sensing and field validation.
Activities Considered in Cumulative Effects	Past activities that are included in the cumulative effects analysis include timber harvest, fuels activities, livestock grazing, the Forest-wide Roadside Hazard Tree Removal and Fuels Reduction Project and private land timber harvest.
	Ongoing and future activities include the Red Mountain Flume/Chessman Reservoir project, Telegraph project, livestock grazing, routine use and maintenance of Forest trails and areas for over-snow winter use, and Divide Travel Planning.
Measurement Indicators	Measurements are qualitative
Thresholds	No threshold is applicable to this indicator
Methods	Past, ongoing, and reasonably foreseeable activities are described qualitatively based on information derived from the FACTS database.
Assumptions	The assumptions for describing past and foreseeable treatments are made based on terminology described in FACTS since these definitions are standardized.

Past Activities

Several past activities never had or no longer have present effects to which the project would contribute. Specifically, projects that involved vegetation manipulation (e.g. timber harvest, and fuels activities) may have impacted lynx habitat at the time of the activity. Some of these impacts may still be apparent in those areas not yet capable of meeting multistory habitat parameters. Table 106 summarizes the effects of timber harvest during three time periods on lynx habitat. Most of the stands that have been harvested in the past have yet to develop multistory characteristics.

Fuels activities that occurred in the past mainly focused on reducing surface fuels. Many of these areas that were treated prior to the 1980s have returned to their 'pre-treatment' conditions especially in favorable growing conditions that accelerate understory development. Fuels activities that have occurred since the 1980s have also reduced surface fuels and created more open conditions that favor shrub and grassland development. These activities have contributed to structural characteristics that may increase structural diversity and subsequent snowshoe hare habitat.

Table 106. Past Forest Service timber harvest activities and their impacts on the availability of lynx habitat by LAU

Decade	LAU	Harvest Type	Acres	Effect
Forest Service Timber Harvest Pre-1960s through 1970s	LAU di-04	Regeneration	1,791	Potential habitat that was regenerated during this time currently comprises pole size trees (5-10" in size) that contribute to stem exclusion conditions today and/or have been impacted by the mountain pine beetle. Intermediate harvest treatments that occurred during this time are most likely trending towards multistory habitat in stands not impacted by the mountain pine beetle. In stands impacted by the mountain pine beetle, today the overstory is most likely dead and/or dying with sufficient regeneration in the understory to satisfy early stand initiation habitat conditions.
		Intermediate	50	
	LAU di-05	Regeneration	133	
		Intermediate	0	
	LAU di-06	Regeneration	867	
		Intermediate	1	
Forest Service Timber Harvest 1980s through 1990s	LAU di-04	Regeneration	44	Potential habitat that was regenerated during this time currently comprises young sapling sized trees (up to 5" in size) that contributes to stand initiation habitat today. Intermediate harvests have resulted in stands that are open grown today with larger trees; however the understories aren't as developed as those areas treated at an earlier time. These stands may provide some snowshoe hare foraging habitat; or, if impacted by the mountain pine beetle, the understories may not comprise early stand initiation habitat.
		Intermediate	101	
	LAU di-05	Regeneration	339	
		Intermediate	24	
	LAU di-06	Regeneration	508	
		Intermediate	149	
Forest Service Timber Harvest 2000 to 2014	LAU di-04	Regeneration	13	Potential lynx habitat that was regenerated at this time is currently in the early stand initiation phase. Intermediate treatments resulted in stands with larger trees and open understories that may have retained some multistory habitat characteristics; more likely these areas are in a mid-seral condition.
		Intermediate	292	
	LAU di-05	Regeneration	128	
		Intermediate	546	
	LAU di-06	Regeneration	66	
		Intermediate	351	

Ongoing Activities

Ongoing activities that have effects to lynx habitat include the Red Mountain Flume/Chessman Reservoir Project. Twenty-two acres of lynx multistory hare habitat are

treated in di-05 which overlaps with the Tennmile – South Helena project. Twelve acres of early stand initiation are treated; and 366 acres of ‘other’ habitat which includes mid-seral and stem exclusion stands. Nine acres of lynx multistory hare habitat are treated in di-06 which overlaps with the Tennmile – South Helena project. Five acres of early stand initiation are treated; 1 acre of stand initiation hare habitat, and 22 acres of ‘other’ habitat which includes mid-seral and stem exclusion stands. Other ongoing activities that may impact lynx habitat or lynx include general road use and management which could disturb lynx depending on the level of use and activity and reductions in roadside vegetation which could provide snowshoe hare habitat.

Reasonably Foreseeable

The Telegraph Creek MPB Salvage and Precommercial Thinning Project is adjacent to the Tennmile – South Helena project; proposed treatments associated with the Telegraph project overlap with LAU di-04. The Telegraph project could result in the removal of up to 2,515 acres of multistory hare habitat, stand initiation, early stand initiation, stem exclusion and ‘other’ habitat [mid-seral, etc.] in LAU di-04 (which overlaps with the Tennmile – South Helena project). The effects associated with the Telegraph project would be cumulative to those anticipated from the Tennmile/South Helena project.

The Divide Travel Plan includes motorized routes that are open to over-the-snow motorized use during the winter. This could result in displacement to lynx; meanwhile, the impacts of winter logging associated with the Telegraph project on lynx would be cumulative to the Divide Travel Plan project.

The private lands within the project area that are capable of supporting forests are dominated by lodgepole pine, either mature trees or seedling/sapling stands that are the result of regeneration harvest in recent decades. Nearly all of the mature trees have succumbed to mountain pine beetle, much of which has been salvage logged. Because the sawtimber component that is economical to remove has been removed and because the balance of the lands are at least 50 years from again producing saw logs, it is likely that there will be very little if any harvest on the private lands within the project area for the next several years. Private lands within the respective LAU but outside of the project area are a mix of lodgepole pine-dominated stands with a similar history and lower elevation stands dominated by Douglas-fir. Much of the lower elevation component has also been subject to past timber harvest, but there is the potential for reasonably foreseeable harvest. However, the level and timing of this harvest is uncertain and, hence, effects to lynx habitat.

Cumulative Effects Conclusions for the Action Alternatives

Implementation of alternatives 2 or 3 would contribute to the effects associated with past timber and fuels activities that have in part shaped the existing condition. Early stand initiation habitat would increase in LAUs di-03 and di-04. This would increase the heterogeneity of lynx habitat overall, while decreasing the amount of winter snowshoe hare habitat in the short term. In the mid to long term, snowshoe hare habitat would increase as these areas develop into stand initiation habitat. Stand initiation habitat currently exists on few acres in LAUs di-04, di-05, and di-06 relative to the total amount of lynx habitat in those LAUs. The increase in stand initiation habitat in the mid to long term would result in more robust hare populations in the analysis area.

Multistory lynx habitat would be removed in LAUs di-04, di-05, and di-06; again resulting in a decrease in snowshoe hare habitat in the short term. This reduction of multistory habitat would also reduce the potential denning habitat; although the increases in downed wood from MPB created snags falling has resulted in increased availability of den sites as well.

Cumulatively, either action alternative would contribute to habitat changes associated with past, ongoing, and reasonably foreseeable activities (Table 107). However, early stand initiation in any of the LAUs would not approach the 30 percent threshold specified in standard VEG S1 of the NRLMD. The disturbance associated with implementation of either action alternative would also contribute to any displacement to lynx that may be occurring as a result of ongoing activities or that could occur upon implementation of the Divide Travel Plan.

Table 107. Cumulative effects to lynx habitat of the Tenmile – South Helena project added to ongoing and reasonably foreseeable projects, compared to the existing condition. The calculations in the Alternative cells are the result of the proposed treatments in Tenmile + ongoing projects (e.g. Red Mountain Flume/Chessman Reservoir) + reasonably foreseeable projects (e.g. Telegraph Creek MPB Salvage and Precommercial Thinning project).

Snowshoe Hare / Lynx Habitat		LAU di-04	LAU di-05	LAU di-06	Area Total
Multi-Storied Hare Habitat (Winter & Summer Forage)	Existing	6,376 (32%)	4,253 (26%)	4,399 (37%)	15,028
	Alternative 2	5,150 (26%)	3,612 (22%)	4,305 (36%)	13,067
	Alternative 3	5,150 (26%)	3,677 (22%)	4,344 (37%)	13,171
Stand-Initiation Hare Habitat (Winter & Summer Forage)	Existing	2,046 (10%)	261 (2%)	699 (6%)	3,006
	Alternative 2	2,024 (10%)	190 (1%)	678 (6%)	2,892
	Alternative 3	2,024 (10%)	197 (1%)	685 (6%)	2,906
Early Stand-Initiation Habitat (Summer Forage Only)	Existing	675 (3%)	419 (3%)	161 (1%)	1,255
	Alternative 2	3,179 (16%)	2,481 (15%)	526 (4%)	6,186
	Alternative 3	3,178 (16%)	1,997 (12%)	204 (2%)	5,379
Other Forest Habitat* (Not Currently Hare Habitat)	Existing	10,746 (54%)	11,494 (70%)	6,586 (56%)	28,826
	Alternative 2	9,490 (48%)	10,163 (62%)	6,463 (55%)	26,116
	Alternative 3	9,490 (48%)	10,576 (64%)	6,612 (56%)	26,678
Total Potential Lynx Habitat		19,843	16,426	11,844	48,113
**“Other Forest Habitat” is any post-stand initiation habitat structure unable to support hares: (1) dense pole or larger self-pruned sapling stands (“stem exclusion stages”), (2) mid-seral stands with poorly developed understory structure, or (2) mature stands with poorly developed understory structure .					

Irreversible and Irrecoverable Commitment of Resources

Irreversible commitments preclude future options in an area, primarily for nonrenewable resources. There is no irreversible commitment of resources under alternative 2 or 3.

Irrecoverable commitments apply to the loss of production, harvest or use of natural resources. There is no loss of lynx habitat under the proposed actions. There is no irrecoverable commitment of resources under alternative 2 or 3.

Conclusions

Lynx in the northern Rockies are sensitive to changes in forest structure (Squires 2013, Koehler 1990, Squires 2010). Because proposed treatments would reduce overstory and understory vegetation and remove down wood, snowshoe hare habitat and the quality of lynx denning and foraging habitat would be reduced over the short and long-term (greater than 10 years) (Squires 2013, Squires 2010). Thinning could also affect lynx movement across the landscape and can alter lynx distribution within their home range (Squires et al. 2006, Squires et al. 2010).

While there is no evidence that suggests that forest roads pose a threat to lynx (USDA 2007b, p. 3), road construction may reduce lynx habitat by removing forest cover and winter road use may provide access for lynx competitors. Conversely lynx have been documented using less traveled roads where the adjacent vegetation provides good hare habitat and Squires et al. (2010) concluded that forest roads with low vehicular or over-snow vehicle traffic had little effect on lynx seasonal resource-selection patterns in Montana. While preliminary information suggests lynx do not avoid roads (USDA

2007b, p. 26), potential impacts are reduced when access, traffic volume and road speed are reduced.

Both alternative 2 and 3 result in changes to lynx habitat in the analysis area. In the short term there are increases in early stand initiation structural stage and denning habitat and reductions in stand initiation and multistoried hare habitat. In the mid to long term there are increases in stand initiation hare habitat. Many of the planned treatments are in lynx habitat in the stem exclusion structural stage or ‘other’ lynx habitat that do not provide snowshoe hare habitat. Activities in these structural stages would lead to the aforementioned increase in stand initiation hare habitat. Alternative 2 may affect lynx and is likely to adversely affect lynx due to loss of habitat and connectivity between LAU di-04 and di-05. Alternative 3 may affect and is likely to adversely affect lynx due to loss of habitat. Although designated Critical Habitat occurs in the portion of LAU di-05 north of Highway 12, this area is outside of the Tennile – South Helena project area. There is no effect to Critical Habitat under either action alternative.

Forest Plan Consistency

The Helena National Forest Plan was amended in March 2007 with the Northern Rockies Lynx Management Direction, as published in the Northern Rockies Lynx Management Direction Record of Decision (NRLMD ROD) (USDA 2007b). Relevant standards and guidelines from that decision and indication of how the Tennile – South Helena Project meets them are listed in Table 108. See Appendix C of the Wildlife Report for project consistency with all NRLMD standards, guidelines, and objectives.

Standards VEG S1, VEG S2, VEG S5, and VEG S6 include an exception provision for fuel treatment projects within the wildland urban interface (WUI) as defined by HFRA, subject to the following limitation: Fuel treatment projects within the WUI that do not meet standards VEG S1, VEG S2, VEG S5 and VEG S6 may occur on no more than 6 percent (cumulatively) of lynx habitat on each administrative unit (a unit is a National Forest). Application of the exceptions to the standards is also discussed here.

Table 108. NRLMD standards and guidelines applicable to the Tenmile – South Helena Project in LAUs di-04, di-05, and di-06.

Standard	Description	Standard Met?
ALL S1	New or expanded permanent development and vegetation management projects must maintain habitat connectivity in an LAU and/or linkage area.	Yes: The Tenmile – South Helena Vegetation Project is within the linkage area that connects the secondary area to the core area to the north (USDA 2007b, NRLMD Figure 1-1). The area north of Highway 12 is within the core area, while south of Highway 12 is the secondary area. As described above under effects, habitat connectivity is maintained within the LAUs and in the linkage area to the north, therefore standard ALL S1 is met.
VEG S1	Unless a broad scale assessment has been completed that substantiates different historic levels of stand initiation structural stages limit disturbance in each LAU as follows: If more than 30 percent of the lynx habitat in an LAU is currently in a stand initiation structural stage that does not yet provide winter snowshoe hare habitat, no additional habitat may be regenerated by vegetation management projects. Fuel treatment projects within the WUI that do not meet standards VEG S1, VEG S2, VEG S5, and VEG S6 shall occur on no more than 6 percent (cumulatively) of lynx habitat on each administrative unit. In addition, fuel treatment projects may not result in more than three adjacent LAUs exceeding the standard.	<p>Yes: As shown in Error! Reference source not found., early stand initiation structural stage that does not currently provide snowshoe hare habitat exists on about 3% of LAUs di-04 and LAU di-05 and about 1% of LAU di-06. LAU di-03, adjacent to the western edge of LAU di-04, has about 1% in an early stand initiation structural stage. LAU di-02, north of LAU di-05, includes 5% early stand initiation structural stage. Standard VEG S1 is met within the LAUs containing the Tenmile – South Helena Vegetation Project.</p> <p>The total fuel treatment exception acres metered out to the Helena NF as part of the NRLMD Incidental Take Statement are 26,400 acres. To date, the Forest has treated 131 acres of lynx habitat subject to the WUI exception. Treatments in early stand initiation, stand initiation, and multistory habitat are well under the limit.</p> <p>(Note, some of the multistory, early stand initiation, and stand initiation habitat are outside of the WUI; these acres will be field validated and if habitat is confirmed in these types, these stands will be dropped from treatment and the above calculations reflected accordingly.)</p>

Standard	Description	Standard Met?																												
VEG S2	<p>Standard VEG S2 applies to all timber management projects that regenerate forests, except for fuel treatment projects within the wildland urban interface, subject to the following limitation: Fuel treatment projects within the WUI that do not meet standards VEG S1, VEG S2, VEG S5, and VEG S6 shall occur on no more than 6 percent (cumulatively) of lynx habitat on each administrative unit. Timber management projects shall not regenerate more than 15 percent of lynx habitat on NFS lands within an LAU in a ten-year period.</p>	<p>Yes: Since January 2006, four NEPA project decisions resulted in regeneration of lynx habitat in the three analyzed LAUs. This includes the Forest-wide Hazardous Tree Removal and Fuels Reduction – HFRA Project (LAUs di-04, di-05 and di-06), the Clancy-Unionville Vegetation Manipulation and Travel Management Project (LAUs di-05 and di-06), the Red Mountain Flume Chessman Reservoir Project (LAUs di-05 and di-06), and the Park Lake Hazardous Tree Removal (LAU di-06). The following table displays the acres regenerated by LAU, along with the proposed acres regenerated by alternative for the Tenmile – South Helena Vegetation Project.</p> <table><tr><th>LAU</th><th>di-04</th><th>di-05</th><th>di-06</th></tr><tr><td>Acres lynx habitat on NFS lands</td><td>18,755</td><td>13,350</td><td>10,661</td></tr><tr><td>Acres regenerated in lynx habitat in last 10 years</td><td>13</td><td>128</td><td>66</td></tr><tr><td>Alternative 2 Proposed acres of regeneration of lynx habitat</td><td>0.2</td><td>1870</td><td>337</td></tr><tr><td>Alternative 2 Total acres regenerated (percent)</td><td>13.2 (<1%)</td><td>1998 (15%)</td><td>403 (4%)</td></tr><tr><td>Alternative 3 Proposed acres of regeneration of lynx habitat</td><td>0.1</td><td>1428</td><td>14</td></tr><tr><td>Alternative 3 Total acres regenerated (percent)</td><td>13.1 (<1%)</td><td>1556 (12%)</td><td>80 (1%)</td></tr></table> <p>Standard VEG S2 is met under both alternatives 2 and 3 in all LAUs.</p>	LAU	di-04	di-05	di-06	Acres lynx habitat on NFS lands	18,755	13,350	10,661	Acres regenerated in lynx habitat in last 10 years	13	128	66	Alternative 2 Proposed acres of regeneration of lynx habitat	0.2	1870	337	Alternative 2 Total acres regenerated (percent)	13.2 (<1%)	1998 (15%)	403 (4%)	Alternative 3 Proposed acres of regeneration of lynx habitat	0.1	1428	14	Alternative 3 Total acres regenerated (percent)	13.1 (<1%)	1556 (12%)	80 (1%)
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Standard	Description	Standard Met?
VEG S5	<p>Standard VEG S5 applies to all precommercial thinning projects, except for fuel treatment projects that use precommercial thinning as a tool within the wildland urban interface subject to the following limitation: Fuel treatment projects within the WUI that do not meet standards VEG S1, VEG S2, VEG S5, and VEG S6 shall occur on no more than 6 percent (cumulatively) of lynx habitat on each administrative unit. Precommercial thinning projects that reduce snowshoe hare habitat may occur from the stand initiation structural stage until the stands no longer provide winter snowshoe hare habitat only:</p> <p>Within 200 feet of administrative sites, dwellings, or outbuildings; or</p> <p>For research studies or genetic tree tests evaluating genetically improved reforestation stock; or</p> <p>Based on new information that is peer reviewed and accepted by the regional level of the Forest Service, and state level of FWS...; or</p> <p>For conifer removal in aspen or daylight thinning around individual aspen trees, where aspen is in decline; or</p> <p>For daylight thinning of planted rust-resistant white-bark pine where 80% of the winter snowshoe hare habitat is retained; or</p> <p>To restore whitebark pine.</p>	<p>Yes: Standard is met. Precommercial thinning is proposed in snowshoe hare habitat in LAUs di-05 and di-06. Under Alternative 2, approximately 5 acres of LAU di-05 and 49 acres of LAU di-06 currently in a multi-story or stand initiation structural stage (and thus providing snowshoe hare habitat) are proposed for precommercial thinning. Under Alternative 3, approximately 5 acres of LAU di-05 and 43 acres of LAU di-06 are proposed for precommercial thinning. These acres all fall within the WUI, therefore the exception to the standard would be applied.</p> <p>(Note, some of the multistory, early stand initiation, and stand initiation habitat are outside of the WUI; these acres will be field validated and if habitat is confirmed in these types, these stands will be dropped from treatment and the above calculations reflected accordingly.)</p>

Standard	Description	Standard Met?																																
VEG S6	<p>Standard VEG S6 applies to all vegetation management except for fuel treatment projects within the wildland urban interface, subject to the following limitation: Fuel treatment projects within the WUI that do not meet standards VEG S1, VEG S2, VEG S5, and VEG S6 shall occur on no more than 6 percent (cumulatively) of lynx habitat on each administrative unit. Vegetation management projects that reduce snowshoe hare habitat in multistory mature or late seral forests may occur only:</p> <p>Within 200 feet of administrative sites, dwellings, or outbuildings, etc.; or</p> <p>For research studies or genetic tree tests evaluating genetically improved reforestation stock; or</p> <p>For incidental removal during salvage harvest (e.g. removal due to location of skid trails)</p>	<p>Yes: Standard is met. The Tenmile – South Helena Vegetation Project proposes treatments within multi-story lynx habitat. Proposed treatments include low severity grassland prescribed fire, low severity prescribed fire, mixed severity prescribed fire, improvement harvest, precommercial thinning, private land buffers, regeneration harvest, and shaded fuel break. Low severity grassland prescribed fire and low severity prescribed fire treatments are not expected to alter the structural stage of the treated areas. The remaining treatments will reduce snowshoe hare habitat. The following table summarizes effects to multistory hare habitat.</p> <table><tr><th>LAU</th><th>di-04</th><th>di-05</th><th>di-06</th></tr><tr><td>Acres of multistoried mature or late successional habitat</td><td>6376</td><td>4253</td><td>4399</td></tr><tr><td>Alternative 2 acres proposed treatment in this habitat</td><td>15</td><td>834</td><td>281</td></tr><tr><td>Alternative 2 acres proposed reduction in hare habitat</td><td>15</td><td>655</td><td>92</td></tr><tr><td>Alternative 2 acres proposed reduction in hare habitat within WUI</td><td>15</td><td>634</td><td>92</td></tr><tr><td>Alternative 3 acres proposed treatment in this habitat</td><td>15</td><td>663</td><td>81</td></tr><tr><td>Alternative 3 acres proposed reduction in hare habitat</td><td>15</td><td>566</td><td>53</td></tr><tr><td>Alternative 3 acres proposed reduction in hare habitat within WUI</td><td>15</td><td>541</td><td>53</td></tr></table> <p>Of the treatments that reduce snowshoe hare habitat, all but approximately 22 acres in LAU di-05 under both alternatives are within the WUI. The 22 acres outside the WUI zone are portions of proposed regeneration harvest units (Units 1, 5, 14, 15, and 17). Field surveys will be conducted to determine if these 25 acres are multi-story mature or late successional habitat. If so, the proposed treatments will be dropped from consideration. The remaining acres proposed for reduction in multi-story snowshoe hare habitat are within the WUI and the exception to standard VEG S6 would be applied. The Tenmile – South Helena Vegetation project complies with NRLMD standard Veg S6.</p> <p>(Note, timber harvest is allowed in areas that have potential to improve winter snowshoe hare habitat but presently have poorly developed understories that lack dense horizontal cover [e.g. uneven age management systems could be used to create openings where there is little understory so that new forage can grow]).</p>	LAU	di-04	di-05	di-06	Acres of multistoried mature or late successional habitat	6376	4253	4399	Alternative 2 acres proposed treatment in this habitat	15	834	281	Alternative 2 acres proposed reduction in hare habitat	15	655	92	Alternative 2 acres proposed reduction in hare habitat within WUI	15	634	92	Alternative 3 acres proposed treatment in this habitat	15	663	81	Alternative 3 acres proposed reduction in hare habitat	15	566	53	Alternative 3 acres proposed reduction in hare habitat within WUI	15	541	53
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Standard	Description	Standard Met?
Guideline VEG G10	Fuel treatment projects within the WUI should be designed considering standards VEG S1, S2, S5, and S6 to promote lynx conservation.	Overall, the project is designed to be responsive to the mountain pine beetle outbreak in the area, promote desirable regeneration, improve conditions for fire suppression effectiveness as well as firefighter and public safety in the area in the event of a wildfire, and maintain diverse wildlife habitats. These goals are compatible with conservation of lynx habitat. Both action alternatives have been designed with VEG S1, S2, S5, and S6 in mind. Furthermore, Alternative 3 has been designed to minimize effects to lynx habitat while still meeting the purpose and need of the project.
Guideline VEG G11	Denning habitat should be distributed in each LAU in the form of pockets of large amounts of large woody debris, either down logs or root wads or large piles of wind thrown trees ("jack-strawed" piles). If denning habitat appears to be lacking in the LAU, then projects should be designed to retain some coarse woody debris, piles or residual trees to provide denning habitat in the future.	Denning habitat is not lacking in the project area. Because of the mountain pine beetle outbreak there are currently about 67 snags per acre on average in the 7-11.9" size class and 7 in the 12-19.9" size class in the project area. These snags will eventually fall to the forest floor creating abundant denning habitat. About 38% of the project area would be treated in Alternative 2 and 28% in Alternative 3 leaving 62% and 72% untreated, respectively.

Wetland/Riparian Habitats and Associated Species

Affected Environment

The Nature of the Resource

Characteristics of Wetland/Riparian Habitats

Riparian and wetland habitats, while widely distributed across the project area, are usually highly localized and occupy a relatively small share of the total landscape. The presence of surface or near-surface water produces local microclimates that differ from those of surrounding upland areas and allows for more productive and biologically diverse habitats. Wetland and riparian areas host unique vegetation assemblages and may be the only herbaceous communities in forested ecosystems or the only tree-dominated community in grasslands. As a consequence, they provide habitat for a disproportionate number of wildlife species (Thomas 1979).

A wetland is a land area that is saturated with water, either at the surface or in the root zone, and as a result, supports hydric soil and vegetation adapted to flooding (Mitsch and Gosselink 2007, p. 27-31). Wetlands in the Divide landscape and the project area vary widely in size and in the degree to which they support water through the season. They include marshes (with surface water), swamps (forested wetlands), bogs (with sphagnum moss mats), wet meadows (subirrigated grasslands), sedge meadows, and seeps (wet areas around springs). These sites vary in size, but most are localized and frequently isolated from other such habitats. Wetlands often lie within riparian zones adjacent to open water, but some, such as wet meadows and springs, occur as independent entities in upland landscapes and are referred to as isolated wetlands (Mitsch and Gosselink 2007, p.26). As noted, wetlands are productive, ecologically diverse, and support characteristic vegetation that contrasts with that of surrounding areas. As a result, many wildlife species are drawn to these sites.

A riparian zone is an area with distinctive soil and vegetation between a stream, pond, or other body of open water and the adjacent upland. Most riparian zones include a certain amount wetland habitat, and in some cases, the entire zone is wetland. Many riparian zones, however, are a mix of wetland vegetation (dominated by aquatic plants adapted to saturated soil) and vegetation adapted to more mesic conditions (including trees and shrubs). Regardless of the relative proportion of hydric and mesic substrate, riparian zones are typically more productive and diverse than the adjacent upland habitat (Thomas 1979, p. 40-47). Wetland and riparian habitats are essentially ecotones that occur at the interface of aquatic and truly terrestrial ecosystems (Mitsch and Gosselink 2000).

In this report, the term “wetland” is used when referring to the distinctive habitat associated with water-saturated soils; the term “riparian” is used when referring to the ecotonal area adjacent to an open body of water, regardless of whether or not wetland habitat is present (although it often is).

Wetland/Riparian Habitat Associated Species

Wetland habitats and riparian zones provide more breeding habitat for birds than any other kind of habitat association in North America (Kauffman et al. 2000). In the Rocky Mountain region, they contain more vulnerable bird species than any other community

type. Numerous landbird species (ruffed grouse, willow flycatcher, yellow warbler, and song sparrow) are tied to the shrubs or deciduous trees associated with riparian environments (Hutto and Young 1999). Studies of birds associated with riparian willow habitat conducted by the Northern Region landbird monitoring program in 2001 found 13 bird species that were “riparian-dependent” and 10 others that were “riparian-associated” (Young et al. 2003). Riparian-dependent species were Wilson’s warbler, spotted sandpiper, fox sparrow, American redstart, willow flycatcher, common yellowthroat, veery, cedar waxwing, northern waterthrush, common snipe, song sparrow, yellow warbler, and Lincoln’s sparrow. Riparian-associated species were MacGillivray’s warbler, spotted towhee, gray catbird, red-winged blackbird, white-crowned sparrow, dusky flycatcher, lazuli bunting, warbling vireo, red-naped sapsucker, and black-headed grosbeak. The study included four routes in the Tenmile – South Helena project area, and results for these areas reflected those of the region as a whole.

Amphibians require riparian/wetland areas for part, if not all, of their life cycle. Because of limited mobility, their survival is favored by areas with abundant wetland habitat, either in extensive contiguous formations or as an array of smaller sites in close proximity, so as to allow effective dispersal and migration to other unoccupied habitat. Amphibians that reside in the Tenmile and upper Prickly Pear drainages include spotted frogs, western toads, and long-toed salamanders. Leopard frogs, once common, are now probably extirpated from this landscape.

Mammals are also drawn to wetland and riparian areas because of their productivity, vegetative diversity, proximity to water, and favorable microclimates, which combine to provide a varied and abundant forage supply. Some species, such as mink, beaver, muskrats, and water voles, are tightly tied to aquatic and wetland environments. Most wide-ranging mammals, such as deer, elk, moose, foxes, bears, and mountain lions, even if they spend the bulk of their time in upland habitats, are sooner or later drawn to wetland and riparian areas—for water, forage, prey, cover, or thermal relief. These localized sites are thus focal habitats that concentrate mammalian activity.

Recent wildlife field surveys indicate that with the demise of thousands of acres of mature pine forest in the wake of the mountain pine beetle outbreak, a number of species that were formerly widely distributed through those habitats are now concentrating to a greater degree in forested wetland and riparian areas. Most of these sites support patches or strips of green Engelmann spruce, subalpine fir, Douglas-fir, and aspen, and in many cases, provide the only viable mature forest environments in the area [Figure 68]. Species that have been noted to concentrate in wetland/riparian forest to a greater degree than in the past include red squirrels, red-breasted nuthatches, white-breasted nuthatches, mountain chickadees, Townsend’s solitaires, and ruby-crowned kinglets. Traditional wetland and riparian associated species continue to occupy these habitats, as well—although whether or not the new press of upland species into wetland habitats is affecting primary wetland species’ abundances and behavior patterns is unknown at this time.



Figure 68. Part of a complex of subirrigated wet meadows interspersed with conifer forest in the project area. This is an excellent summer habitat for elk as it is for numerous other species.

Human Influences

Riparian areas tend to attract a disproportionate amount of human activity— recreation, home building, livestock grazing, and roads. Partly as an aid to quantifying human impact on riparian zones, streamside riparian habitats have been designated as Riparian Habitat Conservation Areas (RHCAs)—corridors that vary from 150 to 300 feet on either side of the stream channel.

Helena NF Fisheries biologists and hydrologists have classified roads and motor trails within RHCAs as “high risk roads”. This includes the open motorized routes and closed roadways that may continue to deposit sediment in the streams. They consider the zone of influence of these routes to extend out 300 feet on either side along fish-bearing streams and 200 feet along non-fish-bearing streams [See the Fisheries and Watershed Specialist Reports].

Since the 19th century, human enterprises, including roads, have substantially reduced the effective size of riparian habitats. Elimination of much of the beaver population—initially a consequence of the 19th century fur trade and since then, a means of providing dry ground for livestock grazing, agriculture, settlement, and roadways—has been a major contributing factor. Channelization of streams, diversion of water for irrigation, and draining of wetlands are other means by which riparian habitats have been modified to serve these ends. Roads in riparian zones influence the quality of wildlife habitat by slowly pushing sediment into local water bodies. While some roads actually cross stream channels, most generate sedimentation merely by running nearby in the RHCA. Vehicle traffic and other human activity associated with roads also serves to interfere with normal wildlife activity in these key habitats.

Project Area Status

In the project area, Tennile Creek is the largest single watershed in the project boundary; it is roughly the western two-thirds of the project boundary. The Prickly Pear Creek watershed drains the eastern third of the project boundary.

Wetlands and riparian habitats occupy a very minor portion of the Tennile – South Helena project area—less than two percent of the project area boundary. The project area encompasses the headwaters of numerous drainages—sites full of springs, seeps, high water tables, and, often, marginal drainage. Also, most streams in the area have not been altered and channelized in recent decades and thus retain their naturalized riparian habitat configurations. While very localized, these productive habitats are well distributed throughout the project area, usually in association with perennial, ephemeral, and intermittent streams, but also with isolated ponds and springs and with perched water tables (as subirrigated wet meadows).

A majority of riparian zones in the project area are densely forested, relatively narrow, and include considerable non-wetland habitat or habitat that is wet only part of the year. Even in drainages with rich meadowland, such as the upper reaches of Minnehaha, Tennile, Banner, Buffalo, and Travis Creeks, and Upper Corral and Colorado Gulches, substantial segments of the stream bottoms are narrow and heavily forested. Within these timbered riparian zones, as well as in a number of upland forests where the pine beetle has not killed extensive stands, scattered seeps, springs, and other diminutive wetland sites provide covered foraging and watering areas useful to many wildlife species.

The most common non-forested wetlands are subirrigated wet meadows, typically situated around the origins of streams or anywhere else along creeks where the riparian zone spreads out and drainage is poor. Less often, the meadows encircle ponds or occur as isolated wetland pockets in the uplands. A few of these sites include true bog habitat, dominated by sphagnum moss, but this is an uncommon wetland type here. An examination of aerial photographs of the project area reveals wet meadowlands across the landscape in nearly all drainages, as indicated previously. These concentrate wildlife activity, but some provide better habitat than others. The quality of forage for native grazers is highly variable, ranging from diverse associations of palatable grasses, sedges, and forbs to coarse sedges and reeds generally ignored as food source.

Riparian shrub communities—typically, willows, redstem dogwood, alders—are more common in riparian reaches and wetland areas such as the Tennile Creek and generally decrease in abundance as does soil moisture. However, some of these tall “riparian” shrubs also occur in upland habitats on well-watered slopes and benches. They are particularly useful to browsers such as moose and deer, and they also support robust bird populations.

A query of motorized road and trail features that intersect wetland features of any type indicates there are about 41.5 miles of motorized route segments that pass through wetland features of some type in the Tennile – South Helena project area. This value grossly overstates the actual length of motorized routes in wetland areas (intersection of a motorized route with an identified wetland boundary), which is about one-half mile total

in the project area boundary. Obviously, motorized routes have been designed with minimal wetland crossings.

The primary wetland descriptions below identifies riparian and wetland sites in the project area that are prominent enough to consistently draw in wide-ranging wildlife and support resident associations of birds, mammals, and amphibians. Those that are classified as “primary wetlands” include substantial wet meadow, marsh, bog, or riparian shrub often in a matrix with forested habitat; these are excellent wildlife habitats. Those labeled as “other effective wetland areas” feature long reaches of narrow forested riparian zone; small scattered meadows, springs, and ponds; or considerable non-wetland habitat in the riparian zone (dry/mesic fields or forest stands). Also included are some productive areas that have been heavily compromised by human activity—roads, mining sites, channel modification, and homesites. This list is not comprehensive, but it includes the most valuable areas to wildlife in the project area. The source data is from the US Fish and Wildlife Service wetlands and deepwater habitats feature class, and is supplemented with information gained from reviewing imagery.

Habitat Descriptions of Primary Wetland Areas

Chessman Reservoir

This reservoir is about 95 acres. Wildlife does have access to it, and waterfowl and other migratory birds were observed. Associated with this reservoir is an extensive wetland on the south edge of the reservoir, nearly 40 acres of mixed wetland types, and more unclassified adjacent forested wetlands.

Black Hall Meadows

This is an extensive area, roughly four square miles, north and east of, and including, Black Hall Meadows that is the head of Colorado Gulch. There are about 90 ponds, emergent, and forested/shrub wetlands. One patch is mapped at roughly 44 acres, but is likely almost twice that size based on the appearance of the adjacent meadow vegetation. The remaining wetlands are up to two-and-a-half acres. The area at Black Hall Meadows and for about a mile east is relatively flat along the Lewis and Clark – Jefferson County lines; about half of the wetlands are located in this gentle terrain. The remaining wetlands are in steeper terrain along drainages, and are generally smaller. These wetlands are all in the Lazyman Gulch roadless area, and as such are further valuable in offering low levels of disturbance, in general.

Upper Tenmile Creek

There is a complex of forested and emergent wetlands located near the headwaters of Tenmile Creek. The forested wetlands are scattered throughout approximately one square mile, and the emergent wetlands are centered primarily on a location called Travis Reservoir. Recent imagery suggests this emergent wetland is in good condition as far as vegetative cover indicates, although it is mostly in private ownership.

Moose Creek

Moose Creek drains the west slopes of Colorado and Black Mountains. There is one five acre emergent wetland near Colorado Mountain. The remaining wetlands are primarily

forested with small openings of emergent wetlands. There are numerous wetlands in this drainage, and are easily distinguished with imagery given the decline in overhead canopy cover. There is one wetland mostly on private land at the downstream end of the stream, near Tenmile Creek; it is primarily emergent on private land and wetland shrub where on the Forest.

Minnehaha Creek drainage along the Continental Divide

There are numerous scattered wetlands along the Continental Divide west of Minnehaha Creek, including the Deer Creek and the first western fork of Minnehaha Creek. While there are areas of extensive beetle-impacted lodgepole pine, there is just as much unaffected Douglas-fir cover. These wetlands are all in the Jericho Mountain roadless area, and as such are further valuable in offering low levels of disturbance, in general.

Upper Walker Creek

Upper Walker Creek has numerous small drainages, nearly all with emergent or forested wetlands. The drainages generally run north, and Walker Creek crosses the Forest boundary at the north edge of the project area near US 12. The inventoried wetlands are few, but with the decline in forest canopy cover, any more small wetlands are clearly discernable. This drainage has distinctly more Douglas-fir coverage than lodgepole pine, and therefore offers well-distributed forest cover in addition to wetland openings. These wetlands are all in the Jericho Mountain roadless area, and as such are further valuable in offering low levels of disturbance, in general.

Buffalo Creek

Much of the upper Buffalo Creek drainage is under private ownership, although the seasonally wet meadows are largely in a residential area and may be useful for wildlife. Forest jurisdiction begins near the confluence of Buffalo and Travis Creeks and continues east for about a mile. The wetlands are emergent and forested and are spatially close to Buffalo Creek. Because this low elevation area is dry relative to the higher elevations found to the west and there are far fewer upland wetlands, these creekside sites have increased value to wildlife.

Corral Gulch

Like Buffalo Creek, Corral Gulch is a generally dry location with mixed ownership. Very little wetland area is available on Forest Land and is found where the topography is relatively flat. The wetlands found here are generally forested, with small openings. Wetlands here have increased value to wildlife because potential water and vegetative greenness are limited in the dry east side of the project area.

Habitat Descriptions of Other Effective Wetland Areas

Tenmile Creek

This is the one riverine reach classified as such within the project area boundary. The riparian width for most of its length is confined on one side by the Rimini road prism, and occasionally on the opposite side by tailings piles or other man-made features. There exists little overhead coniferous and deciduous cover above the stream for much of its length, but there are bankside trees present. Also, there are isolated riparian shrubs and

open meadows scattered along this reach. Understory vegetation varies, partially reflecting the ownership pattern. The stream crosses privately owned land above and below this reach, and the vegetative cover varies on private land.

Where the stream course is not adjacent to the road and there is substantial shrub cover, this stream could be classified as a primary wetland, although there are but a few of these features, both emergent and forested. These wetlands are likely valuable to wildlife, in particular big game, because there are also large meadows nearby for alternate forage and

Scott Reservoir

This reservoir is about 30 acres in size. It does not have extensive adjacent wetlands like Chessman Reservoir. Nearby wetlands vary in size from less than a tenth of an acre to about six acres, and are mostly emergent and forested/shrub types.

Upper Banner Creek

There is a 25 acre forested and emergent wetland north of “Gould Diggings” where the first uppermost tributary meets Banner Creek. Vegetative cover in the emergent wetland is lush. In the forested areas, about half of the overstory cover is lost as a result of beetle activity. The stream channel in this wetland has been obviously altered by human activity.

Beaver Creek below Chessman Reservoir

There is one 17 acre meadow complex adjacent to the Chessman Road and it is solely on the Helena NF. This wetland is primarily emergent and bordered by forested wetland. There is evidence of man-made alteration.

Moose

The Shiras moose (*Alces alces shirasi*) is widely, but erratically distributed across the Rocky Mountains of southern Canada and the northern U.S. During the 20th century, Shiras moose dispersed southward into areas where they had not been observed by explorers and settlers in the 1800s (Kay 1997); but lately, populations have been declining in several parts of the west. In Montana, moose are becoming less common in some areas (the Big Hole) and more so in others (the Centennial Valley and lower Missouri River) (Foresman 2012, p. 374-375). Hypotheses as to why some populations are shrinking include climate change-driven increases in parasites, decline in the quality of foraging habitat, and rising predator populations. Hunting pressure on moose has fallen significantly since 2006 and is not seen as a driving factor.

Moose are generally solitary animals and their numbers in and around the Helena NF are inherently low compared to those of elk and deer (MFWP observation records; personal observations of HLCNF wildlife staff). With the exception of cow/calf pairs, moose social groupings are temporary and usually an artifact of animals migrating into the same preferred habitat sites and tolerating one another. Most key habitat is defined by the availability of forage: palatable deciduous shrubs, tall forbs, and, periodically, aquatic vegetation.

In the Tenmile – South Helena project area (and across the larger Continental Divide landscape) this habitat is naturally fragmented because of its association with wetlands, riparian areas, drainage-head basins, productive north- and east-slope forest, and other habitat features with discontinuous distribution on the landscape. In spring, summer, and fall, moose frequently move from one site to another, spending a few days at a given locale before moving on (Costain 1989, p. 138-143; Costain and Matchett 1992, p. 27-31). On a landscape scale, moose prefer a mosaic of densely-forested, open-forested, and unforested shrub habitats. This provides the balance of forage, thermal relief, and calving sites they require (Costain 1989; Costain and Matchett 1992). Moose are not typically found in contiguously forested country.

While moose may spend part of the winter in stands of mature timber at mid-elevation, most winter range is concentrated in lower elevation riparian areas where browse is plentiful and snow depths are more moderate (Costain 1989, p. 89-90, 34-36). Low-elevation riparian shrub cover in the project area is sparse relative to the needs of wintering moose, and as such the project area has little valuable moose winter range. Overall mesic shrub cover, that which provides the most palatable winter forage (willows) is even less available.

Since 2007, only 5 moose licenses have been issued each year for the area covered by hunting districts in the vicinity of the Tenmile – South Helena project area (HDs 215 and 335, which extend from Highway 12 in the north to Butte in the south). Nonetheless, because many moose choose to feed and rest in key habitat sites near roads, putting up with nearby human activity, they are susceptible to poaching or accidental shooting. As a result, human induced mortality inevitably exceeds the hunting quotas set by MFWP (Matchett 1985, p. 132; G. Joslin, comments in MFWP 2007 Elk Survey, HD 335; personal observations of HLCNF wildlife staff).

The Helena Forest Plan addresses the needs of moose by specifying that moose habitat “will be managed to provide adequate browse species diversity and quantity to support current moose populations” (HFP, p. II/19). Moose are also influenced to an extent by Forest Plan management guidelines for elk that limit road density, maintain certain levels of forest cover, and protect key habitat components—particularly riparian areas and other productive wet habitats.

Environmental Consequences

The effects analysis for wetland and riparian habitats is described qualitatively.

Desirable Habitat Conditions	
√	Diverse understory component
√	Healthy plant communities

Effects Common to All Alternatives

There are no effects to wetlands and riparian habitat common to all alternatives aside from natural succession and disturbance events that would continue for the indefinite future.

Effects Common to All Action Alternatives

Timber harvest under all action alternatives would generally exclude wetlands and would retain buffers of trees around drainages with flowing water and other moist sites. These are reflected in riparian buffers that include both the streamside management zones

(SMZ) and additional buffers that may extend further in some areas than the SMZ requirements. These buffers would retain structural diversity characteristic of wetlands and riparian zones important to a variety of wildlife. In all units, no mechanical equipment would operate in SMZs, but incidental tree removal may occur within allowable SMZ retention regulations.

Buffers are also in place during prescribed burning and extend 300 to 400 feet on either side of the riparian zones and up to one to two tree lengths around additional wetlands. No ignition of prescribed fire would occur within SMZ's, although fire may back into them with low intensity (see description of prescribed fire activities). Where fire does burn into the wetlands and riparian zones, it would result in the removal of some dead and decadent shrubs and smaller conifers as well as some ground vegetation. The resulting regrowth should provide more robust vegetation important for species associated with riparian habitats (e.g. ruffed grouse, among others). See also the Hydrology Specialist Report and the Fisheries Specialist Report.

Treatments may be applied in isolated circumstances to remove encroaching conifers and favor aspen regeneration. Untreated areas will be concentrated in habitats favorable, in particular, to big game species: the upper one-third of a slope in major drainages, in saddles, on low ridges, in security areas, and around the heads of drainages.

All treatments would comply with the Montana SMZ law.

Alternative 1

Direct/Indirect Effects

There would be no direct effects to wetlands or riparian zones under the no-action alternative, Alternative 1. The relationship between forest cover and local wetlands and riparian zones would remain more or less as it is now for another couple years, with an abundance of standing dead lodgepole pine close at hand, Douglas-fir stands where they now exist, Engelmann spruce and subalpine fir immediately adjacent to wetlands, and some woody debris scattered about outside the lodgepole pine-dominated stands. However, in the near future the environment in and around forested wetland and riparian zones would shift noticeably as the lodgepole pine trees, which provide the bulk of the associated forest structure, proceed to fall and accumulate as woody debris.

The absence of standing cover would undoubtedly change the way in which some of the more wide-ranging wildlife species approach and make use of these areas—elk, deer, moose, and black bears among them. In addition, without most of the surrounding tree cover and shade, the microclimate of the wet sites would shift, affecting resident small mammals, birds, and amphibians. Changes would include loss of perch and nest sites, changes in ground vegetation, accelerated water evaporation in summer, increased water temperature, and so on (Thomas et al. 1979, p. 46). The downed trees would provide a certain degree of structural complexity useful to small mammals, amphibians, and some birds, and if substantial enough, larger mammals (concealment for bedded animals, for example). An abundance of coarse woody debris would also serve as barriers discouraging cattle—while not numerous in this area—from getting into the wet sites.

Moose

Effects to moose are analyzed in this section because of the relationship wetlands play in moose life history.

Under Alternative 1, the existing conditions would remain unchanged. That is, forest succession and agents of change such as fire, insects, and disease would continue to drive the availability of broad-scale moose habitat in the project area. In forested areas that provided summer thermal cover, the overstory will be further reduced as the beetle infestation runs its course. Hiding cover may be provided by the boles of standing dead trees, but this will be reduced in time as the standing trees fall over. In the meantime, forage production is likely to increase across the landscape with a flush of forbs and shrubs resulting from the decrease in overstory canopy.

Wetland sites are expected to change the least, primarily because there is water available and the adjacent forest cover is either more resilient to agents of damage in general, or the forest types are currently not susceptible to beetles. These sites are currently important to moose and will become more so as the surrounding forest cover is reduced.

No Action Alternative Cumulative Effects

While there can be no cumulative effect from no action being taken, a discussion of the likely trajectory of the wetlands and riparian zones in the project area may prove beneficial.

The sum of past and ongoing cumulative effects has not been of a great enough magnitude to interfere with the ability of wildlife to seek out and make use of productive wetlands and riparian zones throughout the project area in recent history. Retention of current conditions and trends in the project area under alternative 1 would not add to these human generated effects on riparian sites or to reasonably foreseeable actions in a way that would imperil the viability of local wildlife populations or violate Forest Plan standards and guidelines. The natural effects of the beetle epidemic are the largest and most substantial changes in the project area.

Alternatives 2 and 3

With the exception of acres treated and a low-severity grassland prescribed fire treatment in alternative 3, the effects to wetlands under the action alternatives are the same.

Direct/Indirect Effects

Design elements are in place in the form of buffers that will minimize impacts to wetlands and riparian zones. Specifically SMZ requirements prevent use of wheeled or track vehicles in these zones. Mechanical treatments are allowed in the SMZs to the extent that the Montana Guide to Streamside Management Zone Law and Rules are applied. This includes retaining at least 50 percent of the trees greater than eight inches d.b.h. on either side of the creek, protecting shrubs and small trees and retaining snags.

Under alternative 2 and alternative 3, an undetermined number of wetlands and/or riparian zone acres are included in proposed treatment areas. This is not determined as a result of the abundant and widespread nature of wetlands and that there has not been an extensive survey of these features in the project area. However, during project layout and

implementation, these features would be identified and appropriate measures would be taken to establish a buffer. That being said and noting the above-mentioned forest practices and project design buffers around wetlands, very little area would actually be impacted. Where aspen occurs and encroaching conifers would be removed to improve site conditions, few trees are likely to be removed, and if the aspen stand is on a wet site, tracked or wheeled vehicles would operate with the restrictions imposed by standard practices. Under alternative 2, there are 70 identified wetland sites that overlap a harvest unit; this is about 13 percent of those mapped in the project area. Under alternative 3, there are 51 identified wetlands that are in harvest units (about nine percent of the mapped wetlands).

Prescribed fire would be applied to 17,303 acres in alternative 2, and 53 mapped wetlands intersect these burn units. In alternative 3, about 13,836 acres would be treated with prescribed fire and 29 mapped wetlands intersect the burn units.

Treatments in some of these wetland buffers are designed to create sustainable riparian habitat by reducing risks of uncharacteristic disturbance agents in these stands and promoting wetland and riparian vegetation through the removal of conifers, mainly dead and dying lodgepole pine. The action alternatives would involve three effects different than what would occur by leaving dead trees to fall on their own: (1) the loss of the cover provided by standing dead trees that are associated with riparian sites would occur quickly through harvest rather than gradually over five to ten years; (2) the bulk of the deadfall in surrounding areas would be removed; and (3) there would be some potential for minor ground disturbance from equipment used in harvest operations.

The sudden loss of cover is likely to be more disruptive to small wildlife species dependent on riparian areas than if it were allowed to pass away by natural means. But, the end result after a year or two would be essentially the same. The removal of all deadfall would be a more substantial problem for a wider variety of species: therefore, it would be mitigated by retaining a margin of undisturbed snags and deadfall in and around the margins of riparian sites (generally one to two tree length; see the riparian and wetland sites design elements in the section General Design Criteria for Wildlife). Green trees of all sizes associated with riparian sites would also be retained (mostly subalpine fir, Engelmann spruce, Douglas-fir, and aspen; see design criteria). Exceptions would be (1) where leaving conifers would suppress the development of aspen and (2) where retention of particular trees or logs subverted the basic intent of the project to minimize fire intensity and promote forest resiliency. As per requirements of the Soils and Hydrology sections, mechanized equipment would not be allowed to operate in riparian areas—with a few potential exceptions involving passage over frozen ground in winter. This would minimize physical disturbance to the sites.

Most wetlands and riparian zones will remain untreated, more so in alternative 3 than alternative 2. These untreated areas will benefit species like the willow flycatcher that tend to be restricted to riparian zones (Hutto and Young 1999).

As a result of proposed mitigation and design elements, disruption of project area wetlands and riparian zones as wildlife habitat would be minimal. Little actual change in wetland habitat is anticipated.

Moose

Direct effects to moose are unlikely given their mobility and low numbers across the landscape. Therefore, effects are indirect changes to habitat.

Both action alternatives would affect hiding cover, but not substantially affect thermal cover associated with wetlands and riparian zones because the adjacent forest cover is either more resilient to agents of damage in general, or the forest types are currently not susceptible to the beetles. Removal of dead trees and most woody debris in treatment units would reduce local hiding cover (useful during the hunting season and for concealment of young calves in spring) but would have little effect on summer use since the thermal value of the overstory outside of wetlands and riparian zones (the key summer component) has already been removed by the mountain pine beetles.

The action alternatives would generally not treat any wetland/riparian features, with minor exceptions to allow prescribed fire to back into wetland-associated vegetation. To the extent that the more open habitat created by the action alternatives promote growth of deciduous shrubs and tall forbs, the project is likely to improve local foraging conditions for moose.

Action Alternatives Cumulative Effects

Cumulative effects are the incremental impacts that the direct and indirect effects associated with the action alternatives have on wetlands or riparian zones in the context of the myriad of other past, present, and future effects on riparian habitats from unrelated activities. The cumulative effects analysis considers spatial and temporal boundaries, how past activities have contributed to the existing condition, and whether the ecosystem can accommodate additional effects. Table 109 summarizes the key items that are taken into consideration for the cumulative effects analysis for wetlands and riparian zones.

Table 109. Cumulative effects considerations for wetlands and riparian zones

Parameter	Discussion
Spatial Boundary	The spatial boundary needs to be expanded to the point at which wetlands and riparian zones are no longer measurably affected. The project boundary satisfies this requirement because this is the scale at which the effects to wetlands and riparian zones can be examined at the stand or treatment unit. The project boundary also provides a sufficient landscape to assess pattern and structure in the context of larger processes.
Temporal Boundary	The temporal boundary ranges from the 1960s (due to a lack of earlier records in the FACTS database) to those future projects that are either listed in the schedule of proposed actions or are planned or implemented on private land within the project boundary.
Past Activities and Existing Condition	The effects of past activities are reflected in the existing condition. Past activities shaped the vegetative and species composition of wetlands and riparian zones that comprise the project area today. The existing condition, which incorporates the changes due to past activities, has been measured by remote sensing and field validation.
Activities Considered in Cumulative Effects	Past activities that are included in the cumulative effects analysis include historical mining and flood events, timber harvest, fuels activities, livestock grazing, the Forest-wide Roadside Hazard Tree Removal and Fuels Reduction Project and private land timber harvest.
	Ongoing and future activities include personal fire wood cutting, the Red Mountain Flume/Chessman Reservoir project, Telegraph project, Divide Travel Plan, livestock grazing, mining, and private land timber harvest.
Measurement Indicators	Measurements are qualitative.
Thresholds	No threshold is applicable to this indicator.
Methods	Past, ongoing, and reasonably foreseeable activities are described qualitatively based on information derived from the FACTS database.
Assumptions	The assumptions for describing past and foreseeable treatments are made based on terminology described in FACTS since these definitions are standardized.

Past Activities

Historical mining operations have had a large impact on stream ecology, and thus on associated wetlands. While this contributes to the existing condition, it should be noted that prior to 19th century mining activity, wetlands, particularly those associated with stream reaches, were likely more extensive in length and width. Stream channels in areas mined are likely more entrenched and rarely overflow their banks, or overflow them to the extent as they did prior to mining activity. This would reduce the area of flooded ground that contributes to wetland development and maintenance. Tailings from placer mining border and shape parts of the stream channel. Flooding in 1908 and 1981 probably had the greatest single effect on the Tennmile drainage (USDA 2008). Discharge in 1981 was three times the previous record (1908) and roughly established the current stream bed. It is reasonable to assume that wetland/riparian zones lost to mining activities were further exacerbated by losses from flooding and resulting channelization.

Past timber harvest has resulted in regeneration and intermediate harvest of about 2,000 acres in the project boundary from the 1960s through 2014. Few regulations were in existence in the 1950s and 1960s that governed management in wetlands and riparian zones; it's likely that timber harvest and fuels activities extended into these areas thereby

impacting the vegetative composition and structure. Because wetlands and riparian zones are desirable to a variety of animals, including domestic livestock, impacts associated with domestic grazing were extensive in the past, prior to the development and implementation of utilization standards on public land.

Ongoing Activities

Ongoing activities that may negatively affect wetlands and riparian zones include private land timber harvest, livestock grazing, and the Red Mountain Flume/Chessman Reservoir project. The impacts of these projects are expected to be minimal however. Allotment Management Plans (AMPs) have been updated for many of the allotments in the project boundary. These AMPs contain provisions for adaptive management in order to be responsive to negative impacts associated with grazing. Best Management Practices that are in place for the Red Mountain Flume/Chessman Reservoir Project ensure that impacts to wetlands and riparian zones are avoided to the extent possible given the need to remove some trees in wetlands and riparian zones.

Reasonably Foreseeable Activities

The private lands within the project area that are capable of supporting forests are dominated by lodgepole pine, either mature trees or seedling/sapling stands that are the result of regeneration harvest in recent decades. Nearly all of the mature trees have succumbed to mountain pine beetle, much of which has been salvage logged. Because the sawtimber component that is economical to remove has been removed and because the balance of the lands are at least 50 years from again producing saw logs, it is likely that there will be very little if any harvest on the private lands within the project area for the next five decades. Much of the lower elevation component has also been subject to past timber harvest, but there is the potential for reasonably foreseeable harvest. However, the level and timing of this harvest is uncertain. All timber harvest on private land, however, is governed by the Streamside Management Zone Law which will minimize impacts to any riparian habitat that may be entered (See Montana Code Annotated 77-5-301).

Both the Telegraph project and the Divide Travel Plan project could also have impacts to wetlands and riparian zones. These are expected to be minimal however due to SMZ laws and other best management practices.

Cumulative Effects Conclusions for the Action Alternatives

Implementation of alternatives 2 and 3 would contribute to the effects associated with past timber and fuels activities where harvest and prescribed fire were permitted within wetlands and riparian zones. There would be short-term reductions in shrub communities with these areas which, combined with grazing effects, would be cumulative.

Overall, however, as with alternative 1, the action alternatives would not add to the sum of the past, ongoing, and reasonably foreseeable cumulative effects in a way that would considerably alter the ability of wetlands and riparian zones to support current wildlife populations or those expected to evolve with changes resulting from the mountain pine beetle outbreak.

Irreversible and Irretrievable Commitment of Resources

There are no irreversible or irretrievable commitments of resources.

Conclusions

Natural changes associated with the mountain pine beetle outbreak would generate substantial short- and mid-term shifts in the environment in and around local wetlands and riparian zones. But, these sites would remain viable as focal wildlife habitats. This will occur under alternative 1 and in those portions of the project area not subject to treatments in alternatives 2 or 3.

Under the action alternatives, the structure and functioning of local wetlands and riparian zones would differ little from what would occur under natural conditions. Dead and live trees within viable wet sites and around their margins would be left intact. Primary departure from natural conditions would be in the surrounding upland areas from which most snags and woody debris would be removed. Wildlife species approaching the wetlands and riparian zones would thus be moving across open grass/forb/shrub habitat rather than through a maze of woody debris. In either case, the overhead cover would be gone. Differences generated by the action alternatives would not be noteworthy. Treatments that mimic disturbance processes (as is the case here) in wetlands and riparian zones are important in maintaining species richness and diversity, both plant and animal.

Forest Plan Consistency

The overarching standard for wetlands and riparian zones as wildlife habitat is riparian standard #9 [HFP, p. II/35], which states that “[r]iparian areas will be managed to be compatible with dependent wildlife species”. Other Forest-wide standards relevant to wetlands and riparian zones are Big Game standard 6 (which includes the Montana Cooperative Elk-Logging Study recommendation to maintain the integrity of moist summer range sites for elk) [HFP, p. II/19], Big Game standard 10 (which requires maintaining adequate browse for moose—often riparian vegetation) [HFP, p. II/19], and Threatened and Endangered Species standard 2 (which requires maintaining the integrity of grizzly bear habitat components—often riparian) [HFP, p. II/19].

There are several management area standards applicable to wetlands and riparian zones. Management Area W-1 has a requirement that “[w]ildlife habitat improvement practices, including road management, prescribed fire, and other techniques, will be used to maintain and/or enhance the quality of big game and nongame habitat” [HFP, p. III/50].

Management Area T2 has the following requirements [HFP, pp. III/35, 37]:

- Wildlife habitat improvement practices, including road management, prescribed fire, and other techniques, will be used to maintain and/or enhance the quality of big game winter habitat.
- Generally, harvesting will only occur in riparian areas if in conjunction with large sale activity on adjacent lands; and
- In riparian areas, any timber harvest should be on a 240 rotation and harvest types should be selection or group selection.
- Management Area T3 has the following requirements [HFP, pp. III/39, 41]:

- Wildlife habitat improvement practices, including road management, prescribed fire, and timber harvest, may be used to maintain and/or enhance the quality of big game summer habitat;
- Generally, harvesting will only occur in riparian areas if in conjunction with large sale activity on adjacent lands; and
- In riparian areas, any timber harvest should be on a 240 rotation and harvest types should be selection or group selection.
- Management Area H1 has the following requirement: “[w]ildlife habitat improvement practices, including road management, prescribed fire, and timber harvest, will be used to maintain and/or enhance the diversity of wildlife habitat” [HFP, p. III/18].
- Management Area H2 has the following requirements [HFP, pp. III/21, 23]:
- Wildlife habitat improvement practices, including road management, prescribed fire, and timber harvest, will be used to maintain and/or enhance the diversity of wildlife habitat;
- Timber harvest will be on a 240 year rotation and harvest types will generally be selection or group selection.

Management Area L2 has the following requirement: “[w]ildlife habitat improvement practices, including road management, prescribed fire, and other techniques, will be used to maintain and/or enhance the quality of big game winter range.” [HFP, p. III/14].

Both alternative 2 and alternative 3 are consistent with the Forest Plan standards that are either directly or indirectly related to wetlands or riparian zones.

Cool Moist Forested Habitats and Associated Species

Affected Environment

The Nature of the Resource

Characteristics of Cool Moist Forested Habitats

Cool moist forested habitats are generally characterized by mixed- and high-severity fire regimes. Frequent non-lethal fires and infrequent stand-replacement fires may occur in the same region depending on weather and fuel accumulations, or individual fires may be of "mixed severity", with many trees dying and many surviving (Arno 1980, Arno 2000).

Historically, fires in cool moist habitats occurred at intervals averaging between 30 and 100 years (Arno 1980, Brown et al. 1994, Arno 2000). Mixed-severity fire regimes were found across a broad range of forest types and covered sizable areas (Arno 2000). Such fires typically left a patchy erratic pattern on the landscape that fostered development of highly diverse communities (Barrett et al. 1991, Arno 2000). As a result of the relatively frequent and highly variable fire treatments, stands often formed a complex and intricate mosaic on the landscape (Arno 2000). These post-fire landscapes provided a diversity of stand structures that benefited a variety of wildlife species.

Cool Moist Forested Habitat Associated Species

Species generally associated with this habitat include martens, pileated woodpeckers and northern goshawks (although these latter two species also occur in other habitats) all of which may potentially occur in the project area.

Human Influences

The combination of logging at the turn of the century and fire-suppression has produced a more homogeneous landscape in the cool, moist forested habitats in the project area dominated by dense, mature trees with little age class diversity. This homogenous forest type comprised primarily of mature lodgepole fed the MPB outbreak, which peaked in 2009, affecting over 74 percent of the lodgepole (and ponderosa pine) stands within the project area with intensities of greater than 90 percent mortality in some stands. In the past, stands often formed a complex and intricate mosaic on the landscape as a result of the relatively frequent and highly variable fire treatments.

Project Area Status

The cool moist forested habitat in the project area comprises the following: subalpine fir occurs on 1,463 acres of the project area; lodgepole pine on 22,880 acres; and Engelman spruce on about 1,131 acres (from the Forest Vegetation Report). These forests, for several decades, had been relatively “healthy” and supported a typical assemblage of interior forest wildlife species, but only a modest array of cavity dependent species (given the relative scarcity of dead trees). Because of the paucity of ground vegetation and understory layering in the lodgepole pine dominated forests, wildlife diversity has been low. But conditions have been favorable for species such as brown creepers, white-breasted nuthatches, red-backed voles, red squirrels, and northern goshawks. The forests also provided hiding and summer thermal cover for elk, deer, bears, and other species.

The condition of these forests is now in rapid transition. Mature forest formations have declined due to the mountain pine beetle. Most of the remaining mature forest overstory is provided by Douglas-fir or other shade-tolerant species, which has been unaffected by the pine beetles. Some of the Douglas-fir is in relatively pure stands, some in stands mixed with now-dead lodgepole pine. The stands dominated by Douglas-fir are now the primary refuge for species needing mature interior forest as a habitat base. Field surveys indicate that this is where goshawks—some of which may have previously nested in lodgepole pine forest—are now staking out all of their nest sites. As well, red squirrels that had previously inhabited the lodgepole pine forests are now shifting to the Douglas-fir as the lodgepole canopy cover and seed supply fade away. Other interior forest species are following suit wherever the transition is possible.

In the future, given the dramatic erosion of mature lodgepole pine forest in the project area, wildlife associations dependent on these forests could also decline. Most species will be able to adapt to the new Douglas-fir dominated mature forests, but population abundances will inevitably decline because of the loss of suitable habitat. On the other hand, generalist species and those favored by open-grown forest, uncanopied habitats, and extensive accumulations of coarse woody debris could increase (e.g. olive-sided flycatchers).

Environmental Consequences

Effects to cool moist forested habitats are evaluated according to the following measures:

Desirable Habitat Conditions
√ Mosaic of seral classes

- Acres of cool moist habitats treated. Cool moist habitats include lodgepole pine, subalpine fir, and Engelmann spruce and their shade-tolerant tree species mixes.

Effects Common to All Alternatives

There are no effects with regards to cool moist forested habitats that are common to all alternatives other than succession and natural disturbance processes that would continue through time.

Effects Common to All Action Alternatives

Timber harvest in the action alternatives would reduce tree density and/or return stands to earlier seral stages and produce a mosaic of structure and tree species composition in the project area. Regeneration harvest proposed mainly within the cool, moist forested habitats will create early seral habitat that favors those species that depend on that dense structure associated with this type of treatment (e.g. snowshoe hare). This type of treatment is designed to mimic historic natural disturbance processes that generally affected large landscapes.

Several bird species associated with cool, moist forests in the project area demonstrate a positive relationship to timber harvest (e.g. olive-sided flycatcher, mountain bluebird, dark-eyed junco); others respond negatively to harvest treatment that reduces stand density and opens up forested stands (e.g. brown creeper, red breasted nuthatch) (Hejl et al. 1995).

Fires occurred at intervals averaging between 30 and 100 years (Arno 1980, Barrett et al. 1991, Brown et al. 1994) in cool, moist forested habitats. Such fires typically left a patchy erratic pattern on the landscape that fostered development of highly diverse communities (Barrett et al. 1991, Arno et al. in prep), at both a fine-grained (within forest stands) and broader scale. As a result of the relatively frequent and highly variable fire treatments, stands often formed complex and intricate mosaics on the landscape (Arno et al. in prep). Prescribed fire in the project area is designed to mimic mixed-severity fires to produce a patchy, landscape pattern for a variety of wildlife that either occur in the project area or have potential habitat (e.g. northern goshawk, pileated woodpeckers, and marten).

Alternative 1

Direct/Indirect Effects

There are no direct effects to cool, moist forested habitats under alternative 1. As described in the Forest Vegetation Report, “forests would slowly change over time through succession and other natural events. Dead and dying trees would eventually fall to the ground. Shade tolerant advance regeneration would likely persist and grow to dominate mixed sites where lodgepole has died. In openings and areas without shade tolerant species established, lodgepole natural regeneration may establish as serotinous cones open in the sun. As the fuel load changes from standing dead to a horizontal

profile, the natural regeneration would have physical barriers, and coupled with the staggering in time of canopy gaps, create a variable height and age lodgepole pine stand, with scattered older trees of the few lodgepole pine trees not affected killed by MPB, and other species of trees. Because the bulk of the landscape is dominated by small to medium sized trees, there would be a period with few old forests. Eventually if no disturbance enhances heterogeneity, this young landscape may again grow mature forests susceptible to large scale stand replacing disturbances over large areas”.

Forests with a dense, multistoried structure are more likely to experience stand-replacing fire than open, park-like stands. In the event of a stand-replacing fire, cool moist forests burn in a mosaic pattern of burned and unburned areas. This is beneficial for some wildlife species especially that utilize burned forest edges (e.g. hairy woodpeckers).

Old stands of cool, moist forests, especially lodgepole pine, are more likely to burn than young stands (Romme and Despain 1989 as cited in Brown et al. 2000, pp. 191-192). When crown fire or severe surface fire kills most of the trees in a stand, surface vegetation is consumed over much of the area, limiting the availability of forage, and cover for animals that use the tree canopy is reduced. Stand-replacing fires alter resources for herbivores and their predators. The habitat would now provide food for millions of insect larvae, thus increasing use by woodpeckers and birds, and provide perches for raptors. Trees that were decaying before the fire now provide nest sites for woodpeckers and then for secondary cavity nesters. For 10-20 years after a fire, grasses, forbs, shrubs and tree saplings reoccupy the site. This habitat provides forage and dense cover for small mammals, nest sites for birds, and a concentrated food source for grazing and browsing ungulates. In 30-50 years after the fire, saplings become trees and suppress the shrubs and herb layers. At this point the habitat again provides hiding and thermal cover for ungulates and nesting habitat. Remaining dead snags continue to fall which reduces habitat for cavity nesters; however this provides habitat for small mammals, salamanders and ground-nesting birds (Smith 2000).

No Action Alternative Cumulative Effects

While there can be no cumulative effect from no action being taken, a discussion of the likely trajectory of cool moist forested habitat in the project area may prove beneficial. Alternative 1 maintains the status quo with regards to landscape level effects on cool moist forested habitats. Mountain pine beetle related mortality is resulting in areas of early seral forests similar to those created by wildfire; furthermore, the dead trees, once they fall, would add to the down woody debris created by those wildfires.

Alternative 2

Direct/Indirect Effects

Alternatives 2 and 3 are designed to reduce tree density and/or return stands to earlier seral stages and promote stand sustainability through timber harvest and prescribed fire. Implementation of alternative 2 would result in the treatment of 8,528 acres as follows: regeneration harvest is proposed on 3,871 acres; intermediate harvest on 1,436 acres; precommercial thinning on 92 acres, and prescribed fire on 3,129 acres.

Implementation of alternative 3 would result in the treatment of 5,158 acres as follows: regeneration harvest is proposed on 2,348 acres; intermediate harvest on 1,436 acres; precommercial thinning on 92 acres, and prescribed fire on 1,282 acres.

Those acres for which intermediate harvest is proposed should develop larger trees over time as the remaining trees are able to take advantage of increased sunlight and nutrients. This is especially important for species such as pileated woodpeckers and northern goshawks that need larger trees for nesting and for Cassin's finches that rely on the seeds from the remaining trees. Intermediate harvest treatments will eventually lead to uneven-aged stands thereby fostering development of highly diverse plant and animal communities. Regeneration harvest will result in the creation of early seral stages, beneficial to species such as snowshoe hares but of less use to species that rely on the structure provided by older stands.

Because risks of wildfire and other disturbance agents will be reduced slightly under these alternatives, wildlife that are associated with stand replacement fires may experience reductions in habitat associated with this type of disturbance. However, if wildfire continues on its current trajectory, ample acres of burned forests should be available into the future.

Action Alternatives Cumulative Effects

Cumulative effects are the incremental impacts the direct and indirect effects associated with the action alternatives have on cool moist forested habitats in the context of the myriad of other past, present, and future effects on cool moist forested habitats from unrelated activities. The cumulative effects analysis considers spatial and temporal boundaries, how past activities have contributed to the existing condition, and whether the ecosystem can accommodate additional effects. The following table summarizes the key items that are taken into consideration for the cumulative effects analysis for cool moist forested habitats. See also Appendix E to the Wildlife Report for more information.

Table 110. Cumulative effects considerations for cool moist forested habitats.

Parameter	Discussion
Spatial Boundary	The spatial boundary needs to be expanded to the point at which cool moist forests are no longer measurably affected. The project boundary satisfies this because this is the scale at which the effects to cool, moist forests can be examined at the stand or treatment unit. The project boundary also provides a sufficient landscape to assess pattern and structure in the context of larger processes.
Temporal Boundary	The temporal boundary ranges from the 1950s (due to a lack of earlier records in the FACTS database) to those future projects that are either listed in our SOPA or are planned or implemented on private land within the project boundary.
Past Activities and Existing Condition	The effects of past activities are reflected in the existing condition. Past activities shaped the age class, density, and species composition of the cool, moist forested habitats that comprise the project boundary today. The existing condition, which incorporates the changes due to past activities was measured by remote sensing and field validation.
Activities Considered in Cumulative Effects	Past activities that are included in the cumulative effects analysis include timber harvest (hazard tree removal as well), fuels activities, and private land timber harvest.
	Ongoing and future activities include the Red Mountain Flume/Chessman Reservoir project, personal fire wood cutting, the Divide Travel Plan, and private land timber harvest.
Measurement Indicators	Measurements include effects to cool moist forested habitat.
Thresholds	No threshold is applicable to this indicator
Methods	Past, ongoing, and reasonably foreseeable activities are described quantitatively based on acres of cool, moist forested habitat affected. Impacts of past activities are based on the FACTS database and summarized according to the types of treatments recorded in the database. The effects on cool forest habitat are based on observed changes to stand structure in the tree dominance types that are capable of providing cool moist forested habitat: lodgepole pine, subalpine fir, Engelmann spruce and shade-tolerant tree species mixes of these dominance types.
Assumptions	The assumptions for describing past and foreseeable treatments are made based on terminology described in FACTS since these definitions are standardized.

Past Activities

Past timber harvest (Appendix E, Table E-1, Wildlife Report) most likely affected the cool moist forested habitats that were in the area at that time. Today, these treatments are reflected in the existing condition. Table 111 summarizes the effects of timber harvest during three time periods on forested habitat in the project area. Not all acres of past timber harvest overlap with cool moist forested habitat.

Fuels activities that occurred in the past mainly focused on reducing surface fuels. These activities most likely have resulted in the creation of snags and subsequent down wood habitat.

Table 111. Past Forest Service timber harvest activities and their impacts on cool moist forested habitats.

Decade	Harvest Type	Acres	Effect
Forest Service Timber Harvest Pre-1960s through 1970s	Regeneration Harvest	489	Cool, moist forested habitat that was regenerated during this time currently comprises pole size trees (5-10" in size). Intermediate harvest treatments that occurred during this time include areas with large trees and developing understories with which may be providing nesting habitat for a variety of species including Cassin's finches. Hiding cover for elk and other species should be developing in the understory as well.
	Intermediate Harvest	3	
Forest Service Timber Harvest 1980s through 1990s	Regeneration Harvest	335	Cool, moist forested habitat that was regenerated during this time currently comprises young sapling sized trees (up to 5" in size) that provides habitat for snowshoe hares. Intermediate harvests have created stands that are more open grown today with larger trees; however the understories aren't as developed as those areas treated at an earlier time.
	Intermediate Harvest	104	
Forest Service Timber Harvest 2000 to Present	Regeneration Harvest	637	Cool, moist forested habitat that was regenerated at this time is currently in the stand initiation phase and in some instances large trees may remain (e.g. shelterwood or seed tree harvests).
	Intermediate Harvest	531	

Ongoing Activities

Table 112 summarizes ongoing activities that may impact cool moist forested habitats and associated species like the flammulated owl and Cassin's finch. Other ongoing activities that may affect dry forested habitats (including flammulated owl and Cassin's finch habitat) include private land development that would affect habitat through removal of trees that provide habitat and permanent conversion to non-forest.

Table 112. Ongoing activities that may impact cool moist forested habitats

Activity	Effect
Timber Harvest on Private/Non-NFS land	Timber harvest reduces nesting habitat and creates early seral conditions.
Livestock Grazing	Ongoing grazing has the potential to reduce the amount of understory vegetation in turn reducing habitat for species associated with a complex understory.
Clancy Unionville Vegetation Manipulation and Travel Management Project	The Clancy-Unionville project has affected cool moist forested habitats primarily in a manner beneficial to most species. Forested stands were opened up and understory vegetation re-invigorated by prescribed fire. Forage habitat is likely to improve as forested units are thinned, thus promoting early-seral vegetation, including browse.
Roadside Hazardous Tree Removal and Fuels Reduction Project	The Roadside Hazard Tree project includes removal of roadside hazard trees that occur within dry forested habitats. This results in reductions in available snag habitat; however, snags are abundant in the portion of the Hazard Tree project that overlaps with the Tenmile – South Helena project area due to the mortality associated with the mountain pine beetle outbreak.
Firewood Cutting	Ongoing firewood cutting results in removal of snags along roadsides and reduces snag availability in those locations.

Reasonably Foreseeable Activities

The private lands within the project area that are capable of supporting cool moist forested habitats are primarily in the western portion of the project area. Nearly all of the mature lodgepole pine trees have succumbed to mountain pine beetle, much of which has been salvage logged. Much of the lower elevation component has also been subject to past timber harvest, but there is the potential for reasonably foreseeable harvest. However, the level and timing of this harvest is uncertain.

Both the Telegraph and Divide Travel Plan projects could also have impacts to cool moist forested habitats. Road closures associated with travel planning would reduce access to large snags along roadsides; conversely roads that remain open would facilitate firewood retrieval.

Cumulative Effects Conclusions for the Action Alternatives

Implementation of alternative 2 or 3 would contribute to the impacts associated with past timber and fuels activities that have partially defined the existing condition. Specifically, the project area would become more open in the short term while stands regenerate and develop understories. Alternatives 2 and 3 would also contribute to those impacts associated with the following ongoing and reasonably foreseeable projects: Clancy Unionville Vegetation project, Roadside Hazard Tree and Fuels Reduction Project, the Telegraph MPB Salvage project, private land timber harvest, grazing, noxious weed treatments, and firewood retrieval.

The Roadside Hazard Tree project would result in snag removal in cool moist forested habitats as does alternative 2 and 3. However, adequate snags will remain in the project area due to the ongoing mortality associated with the mountain pine beetle and because Forest Plan standards would be achieved. Firewood retrieval would have the same effect.

Implementation of alternatives 2 or 3 may also contribute to effects associated with ongoing grazing. As stands are thinned, conditions will favor production of herbaceous and shrub habitats that are attractive to livestock grazing.

Wildlife would be disturbed by all the planned activities across the analysis area. These disturbances would occur over five to ten years and are proposed over a large landscape at one time.

Irreversible and Irretrievable Commitment of Resources

There are no irreversible or irretrievable commitments of resources.

Conclusions

For wildlife species associated with cool, moist forests, a mosaic of age classes and structures would comprise the project area under the action alternatives. Stands that are opened as a result of treatments would result in the short term reduction of hiding cover and other cover requirements but will eventually move toward mature forests, providing habitat components that are beneficial to a variety of wildlife species. The action alternatives achieve the desired condition of a mosaic of seral classes; however, implementation of Alternative 2 would be more effective at achieving the desired condition as more acres are treated.

Forest Plan Consistency

Forest Plan standards applicable to management of cool moist forested habitats (and associated wildlife species) are primarily those included in the respective management areas that occur within the project area. Applicable Forest-wide standards include standards for big game and snags. See the Rocky Mountain Elk and Snag and Down Woody Debris sections for Forest Plan Consistency related to those topics.

There are twelve Management Areas within the project Area; of those, six contain direction relevant to cool moist forested wildlife habitats. These are:

- Management Area H-1 and H-2 - Wildlife habitat improvement practices, including road management, prescribed fire, and other techniques, will be used to maintain and/or enhance the diversity of wildlife habitat.
- Management Area L-2 - Wildlife habitat improvement practices, including road management, prescribed fire, and other techniques, may be used to maintain and/or enhance the quality of big game winter range. Projects will be coordinated for livestock and big game needs.
- Management Area T-3 – Wildlife habitat improvement practices, including road management, prescribed fire, and other techniques, will be used to maintain and/or enhance the quality of big game summer habitat (i.e. cover and forage).
- Management Area W-1 – Wildlife habitat improvement practices, including road management, prescribed fire, and other techniques, will be used to maintain and/or enhance the quality of big game and nongame habitat.

- Management Area W-2 - Wildlife habitat improvement practices, including road management, prescribed fire, and other techniques, will be used to maintain and/or enhance the quality of big game calving and summer habitat.

The action alternatives are consistent with this direction in terms of enhancing habitat for a variety of species associated with cool moist forested habitats, such as olive-sided flycatchers.

Other Prominent Issues

Dry Forested Habitats and Associated Species

Affected Environment

The Nature of the Resource

Characteristics of Dry Forested Habitats

Dry forested habitats in the project area are described in the Forest Vegetation Report under the heading Douglas-fir and ponderosa pine vegetation type. In general terms, dry forested habitats are slower growing than more mesic habitats, include less dense and lush understory vegetation, and have a more open structure. As described in the Forest Vegetation Report, many dry coniferous forests had been shaped by frequent, low-intensity fire that sustains open, large-tree dominated structures (Arno 1980, Hessburg and Agee 2003). Douglas-fir encroachment into grasslands had been rare and limited to time periods with long fire intervals (Gruell 1983).

Understory vegetation in dry forested habitats of Montana consist of grasses, forbs and shrubs. Common species include Idaho fescue (*Festuca idahoensis*), rough fescue (*Festuca campestris*), bluebunch wheatgrass (*Elymus spicatus*), pinegrass (*Calamagrostis rubescens*), Geyer's sedge (*Carex geyeri*), white spirea (*Spiraea betulifolia*), kinnikinnick (*Arctostaphylos uva-ursi*), common snowberry (*Symphoricarpos albus*), heart-leafed arnica (*Arnica cordifolia*), and common juniper (*Juniperus communis*) (Pfister et al. 1977). These plants are important as wildlife forage and browse.

Dry Forested Habitat Associated Species

Wildlife species associated with dry forests that occur in the project area include flammulated owls and Cassin's finch. The flammulated owl (*Otus flammeolus*) is a small insect-eating raptor with specialized habitat requirements. They are secondary cavity nesters in mature or old-growth ponderosa pine and Douglas-fir stands. Occasionally, they are found in mature aspen or cottonwood. Flammulated owls are unevenly distributed because of the scarcity and spotty dispersion of suitable habitat. They forage for large insects at twilight and after dark in open-grown forest formations with productive understories (tall grass, brush, young conifers) (McCallum 1994). This vegetation pattern is key to maintaining an adequate supply of insect prey while providing the owls with perches from which to forage and a substrate for nesting cavities. Patches of denser trees or multi-storied vegetation within or near the open stands are important for roosting (Morgan 1994). Because of the nature of their food base, flammulated owls migrate south in winter. The flammulated owl is a Montana State Species of Concern with a state rank of S3B: potentially at risk on breeding habitat

because of limited and/or declining numbers, range and/or habitat, even though it may be abundant in some areas.

The management strategy for flammulated owl habitat involves maintaining open-grown old-growth ponderosa pine and Douglas-fir forest at low and middle elevation with lightly grazed grasses and shrubs in the understory. The stands should contain a number of large snags with cavities similar to those that will support pileated woodpeckers and northern flickers (Bull et al. 1990). These conditions will not evolve naturally in the short term; as such there is a need to eliminate dense second-growth in these stands and burn away needle accumulations so that native grasses and shrubs can flourish (Morgan 1994).

According to the Montana Field Guide, “[c]assin’s finch occur in every major forest type and timber-harvest regime in Montana, including riparian cottonwood, but are especially common in ponderosa pine and post fire forests; they occur less often in lodgepole pine, sagebrush, and grassland (Manuwal 1983, Hutto and Young 1999)”. They feed on seeds of grasses, conifers, alders and birch; and will also eat buds, leaves, and insects. Cassin’s finch is a Montana State Species of Concern with a state rank of S3: potentially at risk because of limited and/or declining numbers, range and/or habitat, even though it may be abundant in some areas. Breeding bird surveys have indicated a non-significant decline in numbers in Montana and a significant decline survey-wide.

The increased seed sources in post fire conifer forests may explain why Cassin’s finches are one of the more abundant birds in these areas. Cassin’s finch is also attracted to harvested forests and stands where post fire salvage logging has occurred (Hutto 1995, Hutto and Young 1999, Smucker et al. 2005).

Human Influences

As described in the Forest Vegetation Report, “over the last century, fire suppression, livestock grazing, and high-grade logging, among other factors, have altered the structure and function of dry coniferous forests across much of western Montana. Forest structure and composition has been most significantly altered with the lack of fire disturbance; the disruption of the natural fire intervals of the past has resulted in higher stand densities, multi-layered stands of mostly one species, Douglas-fir.”

The major change common to most dry forest types in Montana and in the project area is an alteration in age-class structure, physical structure, tree density, and tree species composition as a result of logging and fire suppression (USDA and USDI BLM 1997). Species associated with late, open dry forests are likely affected the most by changes in habitat conditions that have occurred in dry forests over the past 100 years (USDA and USDI BLM 2000). Flammulated owls and Cassin’s finches may be experiencing reductions in habitat because of the reduction of late, open dry forests. Other migratory bird species commonly found in more dense coniferous habitats, such as golden-crowned kinglets (Hutto and Young 1999), have probably increased in dry forests due to heightened tree density and canopy cover.

Project Area Status

The status of dry forested habitats in the Tenmile – South Helena project area is described in full in the Forest Vegetation Report and summarized here. Dry forests dominate the low to middle elevations, or 44 percent of the project area. As described above, stands of Douglas-fir and ponderosa pine have transitioned to multi-layered, high density stands of mostly Douglas-fir. Western spruce budworm has impacted stands and individual trees have been killed by Douglas-fir bark beetle. Mountain pine beetle killed a high percentage of ponderosa pine throughout the project area.

Flammulated owls are unevenly distributed because of the scarcity and spotty dispersion of suitable habitat. Primary threats are habitat loss to logging and settlement and the transformation of open-grown ponderosa pine stands into dense interior forest as a result of fire prevention (Morgan 1994). Although much of the Tenmile – South Helena Vegetation project area contains dry forested habitats for this species, current suitable habitat is limited from loss of large ponderosa pine and increased density of Douglas-fir. Insect prey may also be somewhat limited in the project area due to the density of trees limiting the amount of understory vegetation. There are numerous flammulated owl observations within the project area (see point observations export from Montana Natural Heritage Program, retrieved on May 14, 2015, from <http://mtnhp.org/mapviewer/>). Surveys have also been conducted by the Forest Service and by citizen monitoring. Table 113 shows the areas surveyed and results from 2005 to 2014 (see maps in project record).

Table 113. Flammulated owl surveys and results within the Tenmile– South Helena Vegetation Project or surrounding area.

Year	Survey by	Areas surveyed with no detections	Areas surveyed with flammulated owl detected
2005	Forest Service	Park Lake, Tenmile Creek	Mount Helena, Unionville
2008	Forest Service	Rimini	Park Lake
2008	Citizen's group	Park Lake, Tenmile Creek	Mount Helena, Unionville
2009	Citizen's group	Mount Helena city park, Park Lake	Tenmile Creek, Unionville
2010	Citizen's group	Park Lake, Unionville	Mount Helena Ridge Trail
2011	Citizen's group	Park Lake	Tenmile Creek
2012	Citizen's group	Park Lake	
2014	Citizen's group		Unionville

Cassin's finch is more common in ponderosa pine habitat than other forest habitats in Montana. This habitat is currently limited in the Tenmile – South Helena Vegetation project area. The decreased understory vegetation caused by dense Douglas-fir understories limits the amount of food (grass and composite seeds, insect larvae) available to this species in the area. There are many observations of Cassin's finch within and surrounding the project area (see point observations export from Montana Natural Heritage Program, retrieved on May 14, 2015, from <http://mtnhp.org/mapviewer/>).

Environmental Consequences

The effects to dry forested habitats are discussed at length in the Forest Vegetation Report and are summarized here. The effects to flammulated owl and Cassin's finch are discussed in full. Effects to dry forested habitats are measured based upon the acres of mountain pine beetle impacted forest regenerated, the resiliency of the forested stands (acres by age class, acres by species, and acres by stand density), and a qualitative discussion of landscape level resiliency. Effects to flammulated owl and Cassin's finch are measured by the increase in open, dry forested habitat.

Desirable Habitat Conditions
√ Late-seral, open stands
√ Open understory

Effects Common to All Alternatives

There are no effects with regards to dry forested habitats that are common to all alternatives other than succession and natural disturbance processes that would continue through time.

Effects Common to All Action Alternatives

Timber harvest in all alternatives would reduce tree density and/or return stands to earlier seral stages. This would reduce habitat for species that prefer dense forests and create new habitat for species that prefer open forests. In treatment areas, canopy cover, vertical layering, and hiding/screening cover would decrease while ground flora, visibility and sub-canopy flyways would increase. Dry forested habitats in the late-seral open stage would increase and move towards desired habitat conditions. This favors wildlife species that prefer open, single-storied mature forests (e.g., mountain bluebirds, flammulated owls) and would reduce habitat for species that prefer dense, multi-storied forest structure more quickly than if natural disturbance processes were left to run their course. All action alternatives are designed to promote ponderosa pine where present.

Thinning in ponderosa pine and Douglas-fir should eventually improve flammulated owl habitat since it will result in creating open stand structure that characterizes flammulated owl habitat (Hayward and Verner pp. 40-41, 1994). The largest trees available and large snags will be retained in thinning units (except where snags pose a safety hazard). Areas proposed for regeneration harvest will take several decades to regenerate to stand structure conducive to flammulated owl habitat. All treatments in forested stands including regeneration and intermediate harvest would reduce snag density.

Flammulated owls are tolerant of humans in general and nest abandonment is rare if owls are disturbed. However, responses to mechanical disturbances (thinning, controlled burning) that flush roosting adult birds may pose a threat in October when birds are migrating (Hayward and Verner 1994, page 41).

Wildfire behavior would be modified within treated areas, making wildfires more controllable to the extent that adjacent untreated areas would be less likely to burn. This indirect effect would benefit both species associated with open, single-storied forests and dense, multi-storied forests.

Prescribed fire would reduce fuel accumulations and remove understory conifers thereby favoring wildlife species that prefer single-storied mature forests and would reduce

habitat for species that prefer denser understory structure. Understory vegetation would increase, with low growing shrubs and forbs.

Fire effects on flammulated owls have not been well studied. It is known that fire suppression has led to stand structure uncharacteristic of dry forests before European settlement. Thick stands of trees may provide roosting habitat but not foraging habitat for owls. Grass and shrubs, habitat for many small mammals that are prey for owls, are shaded out by the dense overstory. Also, owls have difficulty flying through these dense forests. Flammulated owls will benefit from prescribed fire in all Action Alternatives since it will create open understories and promote shrub growth, important habitat structure for owls.

Alternative 1

Direct/Indirect Effects

According to the Forest Vegetation Report, under alternative 1 Douglas-fir stands in the Tenmile – South Helena project area would continue to increase in density and canopy layering, resulting in a decline in ponderosa pine and herbaceous vegetation. The risk of wildfire and insect infestations would increase. Mortality in large diameter Douglas-fir and ponderosa pine would increase. A beneficial result of increased tree mortality is the subsequent increase in habitat for wildlife species that depend on insects and diseases and dead trees (e.g. woodpeckers). While prescribed fire is essential to restore ecological function, in some instances stand-replacing fires may be beneficial to bird species that nest in ponderosa pine. Saab et al. (2005, 2007) found that, in most cases, nest success for birds nesting in ponderosa pine was higher in stand-replacing burns than unburned stands in part due to a reduction or elimination of nest predators following stand-replacing fire.

Based on these vegetation changes, habitat for flammulated owl would continue to decline in the project area. A reduction in herbaceous vegetation would decrease insect prey availability as well. Ponderosa pine habitat for Cassin's finch would continue to decrease, as would their food source (seeds and larvae). The risk of wildfire would remain high, resulting in a high risk of loss of any remaining habitat for flammulated owl or Cassin's finch in the Tenmile – South Helena project area.

No Action Alternative Cumulative Effects

While there can be no cumulative effect from no action being taken, a discussion of the likely trajectory of the dry forested habitat in the project area may prove beneficial.

Past actions (Appendix E Table E-1, Wildlife Report) have created the existing condition of dry forests and flammulated owl and Cassin's finch habitat in the project area. More recent projects in the analysis area did not affect dry forests (Red Mountain Flume Chessman Reservoir) or were designed to remove dead and dying hazard trees (MacDonald Pass Hazard Tree Removal, North Divide Roadside Hazard Removal, Rimini County Roadside Hazard Removal) that did not impact dry forested habitat.

Table E-2 of Appendix E, Wildlife Report lists other types of past projects. These projects did not change dry forested habitat, but would have contributed to disturbance of

wildlife. Table E-3 lists the present/ongoing projects. The Red Mountain Flume Chessman Reservoir Project did not occur in dry forested habitat. The Clancy Unionville Vegetation Project is partially complete, with fuel treatments still being implemented. This project included thinning from below to recreate historic open-mature and old growth ponderosa pine habitats on 10 to 18 acres. These treatments should have improved habitat for flammulated owls. The remaining ongoing activities primarily result in disturbance effects to flammulated owls and Cassin's finches in localized areas.

Appendix E, Table E-4 of the Wildlife Report lists the reasonably foreseeable activities in the project area. Disturbance during project implementation is the primary effect of the Golden Anchor Road, Tennile Road Improvement Project, Rimini Substation, and Minerals Operations. The Telegraph Creek MPB Salvage and Precommercial Thinning project area has very little dry forested habitat; where treatments favor ponderosa pine, flammulated owl and Cassin's finch habitats would be enhanced.

Alternative 1 of the Tennile – South Helena Vegetation project is the no action alternative. The changes to dry forested habitat associated with past, ongoing, and reasonably foreseeable activities occur on very few acres and would not appreciably alter the loss of flammulated owl and Cassin's finch habitat due to natural processes. Flammulated owl and Cassin's finch habitat would continue to decline in the analysis area.

Alternatives 2 and 3

Direct/Indirect Effects

A total of 14,762 acres of dry forested habitat are proposed for treatment under alternative 2 (Forest Vegetation Report). Proposed treatments include improvement harvest (2,071 acres), shelterwood with leave trees (130 acres), low severity prescribed fire (11,527 acres), private land buffers (655 acres) and precommercial thin (379 acres). Alternative 3 would result in the treatment of 11,936 acres of dry forested habitat. These treatments include 1,382 acres of improvement harvest, 102 acres of shelterwood with leave tree harvest, 1,662 acres of low severity grassland prescribed fire, 6,952 acres of low severity prescribed fire, 656 acres of mixed severity prescribed fire, 829 acres of private land buffers, and 353 acres of precommercial thinning.

Improvement harvest and private land buffers would result in large, widely-spaced trees with smaller trees scarce or occurring as clumps in openings within the tree canopy. Shrubs and forbs would be common, but low growing. Treated stands would have increased resiliency. In 50 years species composition would favor ponderosa pine, with Douglas-fir common. Shelterwood harvest would result in 200 to 400 Douglas-fir and ponderosa pine seedlings per acre with widely-spaced large diameter ponderosa pine and Douglas-fir as seed trees. Shrubs and forbs would be common, but low growing. In 50 years species composition would be mostly ponderosa pine with Douglas-fir, aspen, and lodgepole pine. The young ponderosa pine and Douglas-fir would be growing vigorously. Low severity prescribed fire would induce ponderosa pine regeneration and reduce multi-layered understory trees and overall tree density. There would be a re-growth of senesced grass, herb and shrub understory communities and increased vigor for the remaining conifers. In 50 years understory burning would result in less dense stands

with larger mean diameters, and a higher amount of ponderosa pine. Precommercial thins would be used to treat naturally regenerated and planted trees in previously harvested stands to increase growth and improve resiliency by reducing stand density. In 50 years these stands would become mid-seral sized (small sawtimber) stands.

Implementation of alternative 2 would result in an increase in large ponderosa pine, and therefore flammulated owl habitat, on 2,726 acres in the short term, while increasing the amount of ponderosa pine habitat available over time. Increases in shrubs and forbs on 11,527 acres (low severity prescribed fire) would benefit insect assemblages and in turn flammulated owls. Cassin's finch habitat and food availability would increase on all treated acres and be maintained over the long term. The risks of wildfire are reduced under Alternatives 2 (see Fuels Specialist Report). Habitat for species associated with open ponderosa pine forests (flammulated owls and Cassin's finch) would be more likely to persist over time.

Alternative 3 proposes treatment of fewer acres than alternative 2. The effects of those treatments on the vegetation and species remain the same. Alternative 3 includes an additional treatment type, low severity grassland prescribed fire. This treatment occurs in grassland and grassland shrub areas where there are encroaching conifers. These areas would not provide habitat for either flammulated owl or Cassin's finch except perhaps along the periphery. Alternative 3 would increase large ponderosa pine, and therefore flammulated owl habitat, on 2,211 acres in the short term. Fewer acres will be improved to provide future habitat for flammulated owl and Cassin's finch under this alternative.

Action Alternatives Cumulative Effects

Cumulative effects are the incremental impacts that the direct and indirect effects associated with the action alternatives have on dry forested habitats in the context of the myriad of other past, present, and future effects on dry forested habitats from unrelated activities. The cumulative effects analysis considers spatial and temporal boundaries, how past activities have contributed to the existing condition, and whether the ecosystem can accommodate additional effects. Table 114 summarizes the key items that are taken into consideration for the cumulative effects analysis for dry forested habitats. See also Appendix E to the Wildlife Report for more information.

Table 114. Cumulative effects considerations for dry forested habitats

Parameter	Discussion
Spatial Boundary	The spatial boundary needs to be expanded to the point at which dry forests are no longer measurably affected. The project boundary satisfies this requirement because this is the scale at which the effects to dry forests can be examined at the stand or treatment unit. The project boundary also provides a sufficient landscape to assess pattern and structure in the context of larger processes.
Temporal Boundary	The temporal boundary ranges from the 1950s (due to a lack of earlier records in the FACTS database) to those future projects that are either listed in our SOPA or are planned or implemented on private land within the project boundary.
Past Activities and Existing Condition	The effects of past activities are reflected in the existing condition. Past activities shaped the age class, density, and species composition of the dry forested habitats that are present in the project area today. The existing condition, which incorporates the changes due to past activities, has been measured by remote sensing and field validation.
Activities Considered in Cumulative Effects	Past activities that are included in the cumulative effects analysis include timber harvest, fuels activities, livestock grazing, the Forest-wide Roadside Hazard Tree Removal and Fuels Reduction Project and private land timber harvest.
	Ongoing and future activities include livestock grazing, routine use and maintenance of Forest trails and areas for over-snow winter use, Clancy Unionville project, and Divide Travel Planning.
Measurement Indicators	Measurements include effects to dry forested habitat.
Thresholds	No threshold is applicable to this indicator
Methods	Past, ongoing, and reasonably foreseeable activities are described quantitatively based on acres of dry forested habitat affected. Impacts of past activities are based on the FACTS database and summarized according to the types of treatments recorded in the database. The effects on dry forested habitat are based on observed changes to stand structure in the tree dominance types that are capable of providing dry forested habitat: ponderosa pine, Douglas-fir and shade-intolerant tree species mixes of these dominance types.
Assumptions	The assumptions for describing past and foreseeable treatments are made based on terminology described in FACTS since these definitions are standardized.

Past Activities

Past timber harvest resulted in the treatment of over 2,099 acres on the Helena National Forest within the project boundary, many of which were at lower elevations in the dry forested habitats. Today, these treatments are reflected in the existing condition which is currently under-represented in late-seral open grown forests. Table 115 summarizes the effects of timber harvest during three time periods on dry forested habitat currently existing in the project area. Most of the stands harvested in the past do not yet provide large trees suitable for nesting for a variety of species (e.g. flammulated owls, pileated woodpeckers, goshawks).

Fuels activities that occurred in the past in dry forested habitats mainly focused on reducing surface fuels. Many of these areas that were treated prior to the 1980s have returned to their 'pre-treatment' conditions especially in favorable growing conditions that accelerate understory development. Fuels activities that have occurred since the 1980s have also reduced surface fuels and created more open conditions that favor shrub and grassland development. These activities have contributed to structural characteristics that currently provide nesting habitat and in some cases hiding cover.

Table 115. Past forest service timber harvest activities and their impacts on the availability of existing dry forested habitat.

Decade	Harvest Type	Acres	Effect
Forest Service Timber Harvest Pre-1960s through 1970s	Regeneration Harvest	489	Dry forested habitat that was regenerated during this time currently comprises pole size trees (5-10" dbh). Intermediate harvest treatments that occurred during this time are now open grown stands with developing understories that include large trees which may be providing nesting habitat for a variety of species including flammulated owls and Cassin's finches. Hiding cover for elk and other species should be developing in the understory.
	Intermediate Harvest	3	
Forest Service Timber Harvest 1980s through 1990s	Regeneration Harvest	335	Dry forested habitat that was regenerated during this time currently comprises young sapling sized trees (up to 5" in dbh). Intermediate harvests have resulted in stands that are open grown today with larger trees; however the understories aren't as developed as those areas treated at an earlier time. These stands may provide some nesting habitat for species like flammulated owls and Cassin's finches that are associated with open understories.
	Intermediate Harvest	104	
Forest Service Timber Harvest 2000 to 2014	Regeneration Harvest	637	Dry forested habitat that was regenerated at this time is currently in the stand initiation phase and in some instances large trees may remain (e.g. shelterwood or seed tree harvests).
	Intermediate Harvest	531	

Ongoing Activities

Table 116 summarizes ongoing activities that may impact dry forested habitats and associated species like the flammulated owl and Cassin's finch. Other ongoing activities that may affect dry forested habitats (including flammulated owl and Cassin's finch habitat) include private land development that would affect habitat through removal of trees that provide habitat and permanent conversion to non-forest.

Table 116. Ongoing activities that may impact dry forested habitats

Activity	Effect
Timber Harvest on Private/Non-NFS land	Timber harvest reduces nesting habitat and creates early seral conditions.
Livestock Grazing	Ongoing grazing has the potential to reduce the amount of understory vegetation in turn reducing habitat for species associated with a complex understory.
Clancy Unionville Vegetation Manipulation and Travel Management Project	The Clancy-Unionville project has affected dry forested habitats primarily in a manner beneficial to most species. Forested stands were opened up and understory vegetation re-invigorated by prescribed fire. Forage habitat is likely to improve as forested units are thinned, thus promoting early-seral vegetation, including browse.
Roadside Hazardous Tree Removal and Fuels Reduction Project	The Roadside Hazard Tree Project includes removal of roadside hazard trees that occur within dry forested habitats. This results in reductions in available snag habitat; however, snags are abundant in the portion of the Hazard Tree Project that overlaps with the Tenmile – South Helena project area due to the mortality associated with the mountain pine beetle outbreak.
Firewood Cutting	Ongoing firewood cutting results in removal of snags along roadsides and reduces snag availability in those locations.

Reasonably Foreseeable Activities

The private lands within the project area that are capable of supporting dry forested habitats are primarily in the eastern portion of the project area. Nearly all of the mature ponderosa pine trees have succumbed to mountain pine beetle, much of which has been salvage logged. Much of the lower elevation component has also been subject to past timber harvest, but there is the potential for reasonably foreseeable harvest. However, the level and timing of this harvest is uncertain.

Both the Telegraph project and the Divide Travel Plan project could also have impacts to dry forested habitats although this element is rare in the Telegraph project area. Road closures associated with travel planning would reduce access to large snags along roadsides; conversely roads that remain open would facilitate firewood retrieval.

Cumulative Effects Conclusions for the Action Alternatives

Implementation of alternative 2 or 3 would contribute to the impacts associated with past timber and fuels activities that have partially defined the existing condition. Specifically, the project area would become more open in the short term while stands regenerate and develop understories. Alternatives 2 and 3 would also contribute to those impacts associated with the following ongoing and reasonably foreseeable projects: Clancy Unionville Vegetation project, Roadside Hazard Tree and Fuels Reduction Project, the Telegraph MPB Salvage project, private land timber harvest, grazing, noxious weed treatments, and firewood retrieval.

Only thinning of ten to 18 acres within the Clancy Unionville Vegetation Project improves flammulated owl habitat. These acres add cumulatively to the improvement in flammulated owl habitat from the Tenmile – South Helena project, resulting in a total of approximately 2,740 acres (alternative 2) or 2,220 acres (alternative 3) habitat improved.

In the long term proposed treatments from the Tennmile – South Helena Vegetation Project, added cumulatively to other vegetation treatments, will restore resiliency to the landscape and improve dry forested habitats from the existing condition. This will improve habitat for flammulated owl and Cassin's finch in the landscape.

The Roadside Hazard Tree Project would result in snag removal in dry forested habitats as does alternative 2 and 3. However, adequate snags will remain in the project area due to the ongoing mortality associated with the mountain pine beetle and because Forest Plan standards will be achieved. Firewood retrieval would have the same effect. Implementation of alternatives 2 or 3 may also contribute to effects associated with ongoing grazing. As stands are thinned, conditions will favor production of herbaceous and shrub habitats that are attractive to livestock grazing.

Analyses for the Clancy Unionville project, Roadside Hazard Tree project and this project have resulted in a determination of 'may impact individuals but won't cause a loss in species' viability or a trend towards listing' for flammulated owls. Cumulatively, the determination remains the same since the Clancy Unionville project is focusing on improving dry forested habitats and the Roadside Hazard Tree project focuses on the removal of mainly dead lodgepole pine which is not a primary component of flammulated owl habitat.

Wildlife would be disturbed by all the planned activities across the analysis area. These disturbances would occur over five to ten years and are proposed over a large landscape at one time. Individual flammulated owl and Cassin's finch may be disturbed to the point of abandoning a nest. Because there is very little suitable habitat currently in the analysis area, the likelihood of this effect is unknown. Because breeding populations of both flammulated owl and Cassin's finch are low, the effects to the population cannot be determined.

Irreversible and Irretrievable Commitment of Resources

There are no irreversible or irretrievable commitments of resources.

Conclusions

Implementation of either of the action alternatives would result in the restoration of dry forests that will provide habitat in the long term for species associated with these habitats (e.g. flammulated owl and Cassin's finch). However, shelterwood harvest and low severity prescribed fire treated stands would not be suitable as habitat for species that depend on mature, open grown forests for many decades. Alternative 2 is more aggressive than Alternative 3 in terms of harvest treatments and dry forest restoration.

Stands that are opened as a result of treatments would be devoid of hiding cover for about 10 years for elk and other species that utilize the existing stand structure. Shrub richness and abundance in the understory may also decrease in the short term. These initial reductions in richness and abundance are expected to rapidly reverse in subsequent years (Metlen and Fielder 2005).

Restoration activities in dry forested habitats are important because changes in tree species composition and stand structure in the dry forested habitat in the project area have

resulted in stagnant, closed stand conditions. The treatments associated with the action alternatives are designed to re-establish the overstory structure and understory composition as well as the ecosystem processes that historically defined these dry forested habitats. Fire exclusion and other traditional land use practices have resulted in densification of conifer regeneration and associated decreases in understory vigor and richness, a well-documented trend (Metlen and Fielder 2005) in dry forests, especially ponderosa pine, in Montana (Gruell et al. 1982, Gruel 1983, Arno and Gruell 1983, MacKenzie et al 2004).

Flammulated owls consistently select habitat that combines open forest stands with large trees and snags for nesting and foraging, occasional clusters of thick understory vegetation for roosting and calling, and adjacent grassland openings that provide optimum edge habitat for foraging. Some studies report that flammulated owls will nest in selectively logged stands that retain large, residual trees (Hasenyager et al. 1979, Bloom 1983, Wright et al. 1997, p. 512). Due to landscape configuration and placement of treatment units for Alternatives 2 and 3, a mosaic of late, open stands adjacent to grasslands should be created. Furthermore, management for snags in harvest units - i.e. leaving untreated patches - would also address the need for thickets of saplings and pole tree regeneration needed for roosting and calling purposes.

Forest Plan Consistency

Forest Plan standards applicable to management of dry forested habitats (and associated wildlife species) are primarily those included in the respective management areas that occur within the project area. Applicable Forest-wide standards include standards for big game and snags. See the Rocky Mountain Elk and Snag and Down Woody Debris sections for Forest Plan Consistency related to those topics. See also Forest Plan Consistency Appendix B to the DEIS for more details.

Forest Plan standards applicable to flammulated owls are those that provide thresholds for snags. See the Forest Plan Consistency section for Snags and Down Woody Debris.

The flammulated owl is listed as a sensitive species in Region One. Federal laws and direction applicable to sensitive species include the National Forest Management Act (NFMA), the Forest Service Manual, and the Helena National Forest Plan. The NFMA requires the Forest Service to “provide for diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives” [16 USC 1604(g)(3)(B)].

The Project is consistent with the NFMA as one of the purposes of the Project is to promote sustainable conditions in fire-dependent ecosystems. The ecological conditions that would develop under any of the action alternatives should give rise to habitat characteristics to which flammulated owls are associated.

Section 2672.4 of the Forest Service Manual provides direction that biological evaluations will be prepared for all Forest Service planned, funded, executed, or permitted programs and activities for possible effects on endangered, threatened, proposed, or sensitive species. The objectives of the biological evaluation include ensuring that Forest Service actions do not contribute to loss of viability of any native or

desired non-native plant or contribute to animal species or trends toward Federal listing of any species. Habitat modeling done by the Northern Region suggests that habitat exceeds amounts needed for a minimum viable population at both the Forest and Regional scale (Samson 2006). Implementation of either of the action alternatives would not reduce habitat below thresholds identified in Samson (2006). Implementation of either action alternative may impact individuals but won't cause a trend towards listing or threaten species' viability. See the Viability Analysis Section and Appendix D to the Wildlife Report.

There are twelve Management Areas within the project area; of those, six contain direction relevant to dry forested wildlife habitats. These are:

- Management Area H-1 and H-2 - Wildlife habitat improvement practices, including road management, prescribed fire, and other techniques, will be used to maintain and/or enhance the diversity of wildlife habitat.
- Management Area L-2 - Wildlife habitat improvement practices, including road management, prescribed fire, and other techniques, may be used to maintain and/or enhance the quality of big game winter range. Projects will be coordinated for livestock and big game needs.
- Management Area T-3 – Wildlife habitat improvement practices, including road management, prescribed fire, and other techniques, will be used to maintain and/or enhance the quality of big game summer habitat (i.e. cover and forage).
- Management Area W-1 – Wildlife habitat improvement practices, including road management, prescribed fire, and other techniques, will be used to maintain and/or enhance the quality of big game and nongame habitat.
- Management Area W-2 - Wildlife habitat improvement practices, including road management, prescribed fire, and other techniques, will be used to maintain and/or enhance the quality of big game calving and summer habitat.

The action alternatives are consistent with this direction in terms of enhancing habitat for a variety of species such as flammulated owls and Cassin's finch, among others.

Snags and Down Woody Debris and Associated Species

Affected Environment

The Nature of the Resource

Characteristics of Snag and Down Woody Debris Habitats

The Helena Forest Plan defines a "snag" as the stem of a dead tree, at least 6 inches in diameter at breast height (dbh), and, if broken, at least 20 feet high (HFP, p. VI/15). The distribution of snags across the project area in the wake of the mountain pine beetle epidemic is examined in the Forest Vegetation Report. This report examines the role of snags and coarse woody debris as wildlife habitat components.

Tree decay is an ecological function that creates key habitat components, namely snags and logs, for wildlife (Rose et al. 2001). Snags are defined as standing dead trees of pole size and larger (≥ 7 inches dbh). They provide the primary substrate for the cavities that many birds and arboreal mammals require for an array of basic life functions (Thomas

1979, pp. 60 to 77). As well as providing cavities, snags serve as primary foraging areas, perching and resting sites, lookouts, and escape ladders for many species (Davis 1983).

Woodpeckers are the most prominent excavators of cavities in the Divide landscape. Some species, such as pileated and black-backed woodpeckers are able to excavate trees with hard exterior sapwood shells and decaying heartwood. Weaker excavators, such as hairy and downy woodpeckers, as well as diminutive non-woodpecker species such as chickadees and red-breasted nuthatches, select trees with softer exterior wood created by armillaria root rot and other saprophytic fungi (Rose et al. 2001). Most woodpeckers excavate a new cavity each year (Bull et al. 1997), thereby generating a continuous resource for secondary cavity users (species unable to produce their own cavities). Secondary cavity dwellers include several species of owls, myotis bats, kestrels, wrens, tree swallows, bluebirds, marten, red squirrels, and flying squirrels, among others.

Snags continue to be important to wildlife once they fall. Logs provide foraging sites, hiding and thermal cover, den sites, nest sites, and travel conduits for small animals, such as chipmunks, pack rats, deer mice, weasels, marten, toads, and salamanders (Rose et al. 2001). Larger animals, such as bears, forage for invertebrates in logs. Fishers use large logs as den sites; lynx typically select dense patches of downed trees for denning. As logs continue to decay and lose structure, they play an important role in nutrient cycling, soil fertility, and erosion control, among other functions (Maser et al. 1988).

Snag and log occurrence is variable and hard to predict under natural disturbance regimes. A majority of dead tree concentrations are produced by fire, and while it is possible to estimate the relative probability of fire occurrence and expected fire behavior in a particular vegetation/fuel environment, actual predictions as to when and how such events might play out have not proven useful for planning and management purposes. Dry forests (ponderosa pine/Douglas-fir) are shaped by frequent, low intensity fires, which results in open, large tree dominated landscapes and few, large snags. Mixed coniferous forests (subalpine fir/Engelmann spruce/Douglas-fir/ lodgepole pine in the Tenmile – South Helena project area) often experience a mixed severity fire regime, which results in considerable variability in snag density. Cool lodgepole pine and spruce/fir forests generally experience infrequent stand-replacing fires, which generate periodic snag pulses (Lyon 1977).

Insect and disease infestations are also capable of generating large numbers of dead trees, but the result may differ from that produced by fire. Many trees killed by insects, in particular bark beetles, often break off at the base, rather than uprooting, and tend to weaken and fall 5-12 years after death. The shift from an environment dominated by standing snags to one full of logs and other woody debris is thus a relatively rapid phenomenon. This is in contrast to many fire-killed lodgepole pine forests, which (depending on the severity of the fire) may retain numerous standing dead trees for several decades.

Human Influences

The major human influences on snags and down wood are timber harvest, fire suppression, and fuelwood gathering. Timber harvest reduces large green trees available for snag recruitment, removes snags for safety reasons resulting in fewer snags and

recruitment of down wood, and can both increase and decrease the amount of down wood depending on the treatment in an area. As described in the Forest Vegetation Report, the project area has altered age-class structure, physical structure, tree density, and tree species composition. This is in part due to fire suppression. As a result, the number, size, and species of snags are altered, as are the amount, distribution, and size of down wood. Fuelwood gathering removes both snags and down wood from the landscape, particularly along open road corridors. Although these human influences can impact the snag and down wood resources available to wildlife, the effects of the recent pine beetle epidemic surpasses the human influences.

Project Area Status

Habitat opportunities for wildlife species able to take advantage of snags have proliferated since 2006. In particular, woodpecker populations have increased: wildlife surveys indicate that hairy woodpeckers and northern flickers are the most prominent; but pileated, downy, and northern three-toed woodpeckers, as well as red-naped sapsuckers, have increased as well. Black-backed woodpeckers, which are drawn to fire-killed trees, have been identified in the portion of the project area that was burned in 2009 (MacDonald Pass Fire). Nesting potential for pileated woodpeckers is relatively low in the small diameter lodgepole pine forests but feeding opportunities abound. Nesting potential in the dry forested habitats is more abundant. Because most woodpeckers feed and nest in dead trees regardless of overstory conditions, they are able to take full advantage of the new environment.

These conditions are in the process of evolving as more standing dead trees fall, opening up the already spare canopy to a greater degree, diminishing hiding and screening cover, and building up the stock of woody debris on the ground. Field surveys in 2013 indicated that dead trees were beginning to fall at an accelerated pace in many stands that previously had little accumulation of coarse woody debris. As this continues, habitat opportunity will shift toward species adapted to coarse woody debris such as marten.

The current proliferation of snags throughout the project area and the Divide landscape as a whole is a product of the mountain pine beetle epidemic that first became evident around 2005-2006 and now appears to have mostly run its course. In the Tenmile – South Helena project area, effects are evident in ponderosa pine and lodgepole pine forests, the latter of which is a dominant community type across this part of the landscape. Whitebark pine and limber pine have also been impacted, but their numbers are small compared to those of lodgepole pine.

In 2009, at the height of the beetle outbreak, aerial detection surveys determined that 91 percent of the project area (55,680 acres) and 82 percent of the combination boundary (74,336 acres) were actively infested with mountain pine beetles [Aerial Detection Survey data in project record]. Although the affected acreage is extensive, the degree of damage within different stands is highly variable, depending on the proportion of lodgepole pine in the overstory: In pure pine stands, virtually all of the trees larger than 5 inches dbh have been killed [See Figure 52, Figure 53, and Figure 69]; in some mixed stands only scattered trees have been hit [See Figure 54 and Figure 70].



Figure 69. Beetle-impacted lodgepole pine forest near Treasure Mountain with most canopy dead. Although to the west of the Tenmile – South Helena project area, this is representative of conditions in the project. Green trees here are scattered Engelmann spruce and subalpine fir and smaller lodgepole pine (<4-6 inches dbh). Potential for smaller cavity nesters such as hairy and downy woodpeckers, nuthatches, and chickadees will abound in these stands over the next decade. Few dead trees have fallen in this 2012 view but virtually all will be down in 5-10 years.



Figure 70. A mixed conifer stand on Jericho Mountain impacted by mountain pine beetle but retaining substantial green overstory. Surviving overstory trees are mostly subalpine fir and Engelmann spruce. In lower elevation stands, Douglas-fir provides the residual green overstory. Dead lodgepole pine can be seen in the background here.

Standing snags are an ephemeral resource, providing specialized wildlife habitat for only a few years. In a normal “healthy” mature forest, snags are relatively uncommon. But because they come and go in a steady flow, there are always a few available. In the case of the mountain pine beetle outbreak, the dead trees have come nearly all at once and in vast numbers. This pulse of standing snags, which began around 2006 will have exhausted itself in another 10 years, and it will be followed by a period of several decades when there will be few snags on the landscape; fewer than when green mature forests were the norm. Likewise, the local populations of species dependent on standing dead trees for food, shelter, and general structure will increase and decrease with the snag pulse. For the time being, however, and for the next few years, snags will continue to be the most abundant “habitat of special concern” in the project area and surpassing in influence of some of the habitats that we consider to be normal fixtures of the landscape. After that, it will become a severely limited resource, regardless of how forests are managed. The variable that will change depending on management will be the abundance of downed woody debris.

Snag and Down Woody Debris Associated Species

There are many species of wildlife associated with snag and down woody debris. For the Tenmile – South Helena project pileated woodpecker, hairy woodpecker, Williamson’s sapsucker, and marten will be discussed.

Pileated Woodpecker

Pileated woodpecker (*Dryocopus pileatus*) serves as a Forest Plan indicator for old-growth forests because it nests in large diameter snags that occur most frequently in advanced mature stands (Bull and Holthausen 1993). In the Tenmile – South Helena project area, pileated woodpeckers inhabit mixed conifer stands of various configurations, focusing on ponderosa pine as the key tree species. For nesting and roosting, pileated woodpeckers require large standing dead trees [typically >30 inches diameter breast height (dbh)]. The availability of night-time roosting sites, provided most frequently by large hollow trees, has been hypothesized to be even more of a limiting factor than the presence of potential nest sites (Aubry and Raley 2002). Foraging sites are provided by standing trees (dead and alive) and by large logs and stumps, where the woodpeckers feed on a variety of wood-boring insects, preferably carpenter ants (Bull 1987; Bull et al. 1997).

Pileated woodpeckers are very mobile and their home ranges are extensive. The average size of 27 home ranges (sometimes referred to as “territories”) in good quality habitat in the Pacific Northwest has been calculated at 1,234 acres (just under 2 m²) (Bull and Holthausen 1993; Mellen et al. 1992). Pileated woodpeckers have seldom been studied in more marginal habitats that characterize much of the east slope of the northern Rockies in Montana, but field observation suggests that population densities are appreciably lower in these environments.

The Montana Natural Heritage database lists the global status of pileated woodpeckers as ‘G5’: “common, widespread, and abundant (although it may be rare in parts of its range), not vulnerable in most of its range”. Statewide status in Montana is ‘S3’, which is

defined as “potentially at risk because of limited and/or decline in numbers, range, and/or habitat, even though it may be abundant in some areas” (see <http://fieldguide.mt.gov/>).

According to the North American Breeding Bird Survey (BBS), pileated woodpecker populations have been trending upward over a majority of the woodpecker’s range in North America since 1966—thus its G5 ranking (<http://www.mbr-pwrc.usgs.gov/bbs/bbs.html>) (Figure 71). In Montana, in spite of its S3 ranking, the pileated woodpecker has been increasing across virtually all of its range in the state since 1966. Several factors have probably contributed to the increase of pileated woodpecker since the 1960’s and, especially, since the early 1980s. Most are related to the availability of large trees and unlogged habitats; in particular, management for late successional forest reserves specifically for wildlife in the Pacific Northwest and a general policy in recent years of retaining most large-diameter trees, dead and alive, on federal lands throughout the Northwest and the northern Rockies (Bull and Jackson 2011).

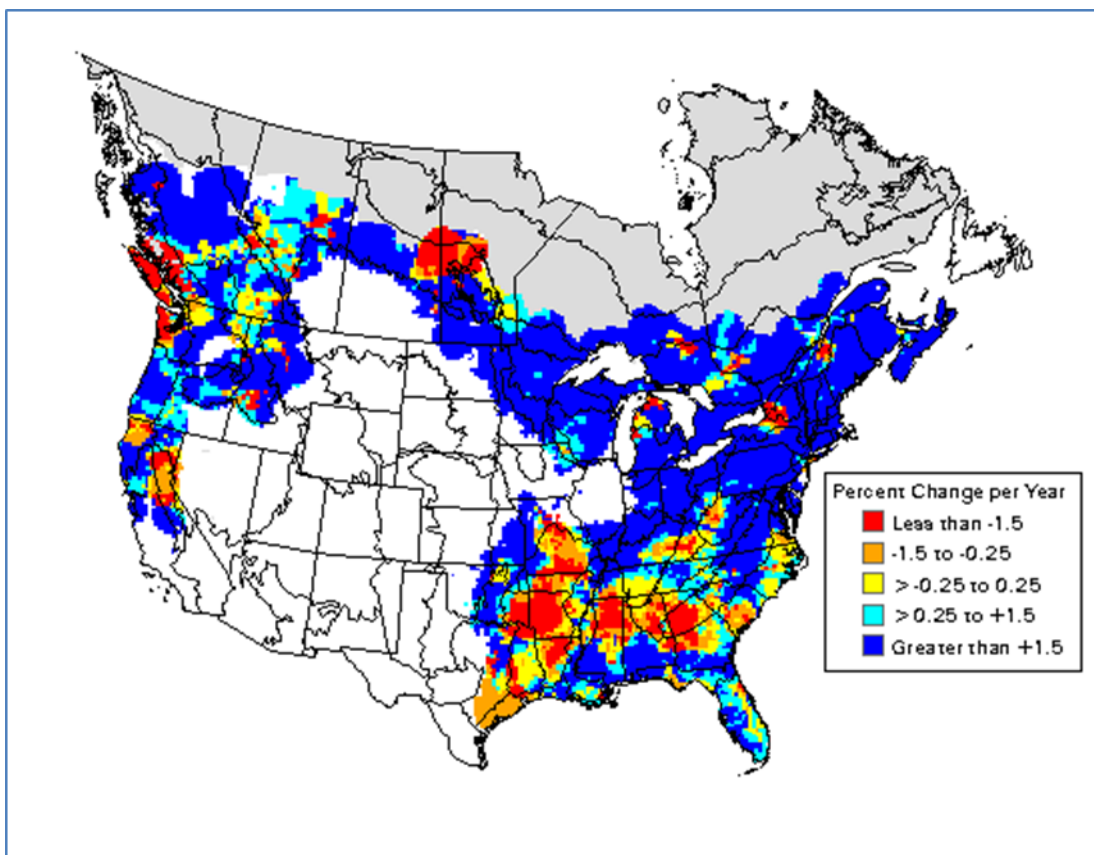


Figure 71. Breeding Bird Survey (BBS) population trend map, 1966–2013: percent change in trend for pileated woodpeckers (Source: Sauer et al. 2014)

There are twelve pileated woodpecker observations within the project area (see point observations export from Montana Natural Heritage Program, retrieved on May 14, 2015, from <http://mtnhp.org/mapviewer/>). Pileated woodpeckers are generally easy to detect because of their high visibility, loud calls, forceful drumming, and distinctive tree excavations.

In the Divide landscape, pileated woodpeckers are typically located in older Douglas-fir and ponderosa pine stands in a variety of settings and also in mixed conifer forests in draws, riparian bottoms, and at the heads of drainages; forest environments capable of producing large trees. A majority of stands in the Tenmile portion of the project area are dominated by lodgepole pine, which are too small to support pileated woodpecker nest cavities and are generally considered sub-optimal as feeding sites (although the woodpeckers have been observed feeding on these trees). Pileated woodpeckers are generally easy to detect because of their high visibility, loud calls, forceful drumming, and distinctive tree excavations.

The eastern portion of the project area is comprised of Douglas-fir and ponderosa pine stands. Such stands historically met the needs of pileated woodpeckers because (1) large, ponderosa pine snags were present, which provided nest habitat for pileated woodpeckers and (2) other smaller snags of a mix of species and down woody debris provided habitat for carpenter ants, which provided excellent foraging habitat. Currently, most of the ponderosa pines are dying from MPB. Understories are dense with several hundred Douglas-fir seedlings. Within 20 years, pileated woodpecker habitat in the Project area will be scarce in the ponderosa pine dominated forests. Most of the ponderosa pine snags have fallen by that time and there will be few remaining live ponderosa pine trees to contribute to long term snag recruitment. Dense Douglas-fir understories will hinder ponderosa pine regeneration and any remaining ponderosa pine would come under increased stress and growth would be inhibited.

Logging over the past century removed the majority of large trees from portions of the project area. Most snags that might have been left after logging have since fallen. Fire suppression has resulted in higher tree densities with smaller diameter classes. Table 117 summarizes the status of snags in the Forestwide and in the Divide Landscape. Snags are abundant at the 7-12 inch size class and should provide adequate foraging habitat. However, few snags are available that meet the size that pileated woodpeckers need for nesting (> 20 inch DBH). Large snags are also limited in the project area (Table 118). Due to the landscape predominance of lodgepole pine, there are virtually no estimated snags >20" dbh.

Table 117. Snags per acre at the Forestwide scale and Divide Landscape based on Forest Plan size classes (from the Forest Vegetation Report)

Forest Plan Size Classes	Snags per acre HNF-wide	Snags per acre Divide Landscape
7-11.9" dbh	50	64
12-19.9" dbh	12	10
>20" dbh	1	<1
Live Trees/Acre >20" dbh	2	2

Table 118. Snags per acre in the project area and combination boundary based on Forest Plan size classes (from the Forest Vegetation Report)

Forest Plan Snag Size Classes	Project Area	Combination Boundary
7-11.9" dbh	67	54
12-19.9" dbh	7	8
>20" dbh	0	<1

Hairy Woodpecker

Hairy woodpecker (*Picoides villosus*) is a Forest Plan management indicator for species dependent on snags [standing dead trees at least 20 feet tall and 6 inches in diameter (dbh)](HFP, p. V1/15). Hairy woodpeckers require dead or decaying trees at least 10 inches in diameter for nesting (Thomas et al. 1979, p. 68), but they often forage on smaller trees. They feed on insects (wood borers, bark beetles, ants, and grubs) as well as on fruits, berries, and sometimes seeds gleaned from dead and dying trees, live trees, logs, stumps, shrubs, and the ground. The snags upon which hairy woodpeckers depend are ephemeral. While some fire killed trees may remain standing for several decades and continue to supply a potential base for nest cavities, their ability to support the insects on which the woodpeckers depend for food deteriorates quickly (typically, within 5-8 years). Trees killed by insects or disease may remain upright for only 2-5 years after becoming suitable for cavity excavation. As the supply of dead trees fluctuates over time, so does the woodpecker population.

Hairy woodpeckers reach their highest population densities in new burns and in stands beset with disease or insect irruptions (such as the current pine beetle outbreak in the Divide landscape). This is primarily a response to the elevated food supply, and as the abundance of wood-boring insects in an area begins to decline, the woodpecker population recedes as well. Covert-Bratland and others (2006) measured a six-fold decrease in population density and more than a ten-fold increase in home range size between the 2nd and 9th year following a stand replacing fire in Arizona. Decreasing food supply, rather than the loss of potential nesting sites, appears to be the principal factor that drives down populations and causes home range size to expand (Welsh and Capen 1992).

Hairy woodpeckers are also capable of inhabiting healthy mature forests as long as a few snags or living trees with a ready supply of insects are scattered through the stand. In these circumstances—with live trees providing up to 50 percent of their food (Sousa 1987)—woodpeckers maintain relatively low population densities. Given the range of habitats and food supplies that hairy woodpeckers are capable of exploiting, their population densities and their home range sizes can vary dramatically. Home ranges run from around 2.5 m² (in recent burns) to more than 37 m² (in healthy forest or areas with few trees). Population density in suitable habitat can range from around 1-2 pairs per m² to 33-35 pairs per m², depending on the availability of snags and other insect-prone trees and, ultimately, the abundance of food provided by those habitat components (Covert-Bratland et al. 2006, 2007).

The Montana Natural Heritage database lists the global status of hairy woodpecker as G5 and the state status as S5: “Common, widespread, and abundant (although it may be rare in parts of its range), not vulnerable in most of its range” (<http://fieldguide.mt.gov/displayClasses.aspx?Kingdom=Animalia>).

The North American Breeding Bird Survey indicates that while hairy woodpecker populations are declining slightly in parts of North America; notably, in the South, Midwest, and Pacific Northwest, populations have been increasing in most of the Rocky Mountain Region (see <http://www.mbr-pwrc.usgs.gov/bbs/bbs.html>) (Figure 72). Populations in many areas have been trending upward more sharply since the mid-1980s coincident with the upsurge in large stand-replacing fires and, more recently, with the advent of widespread mountain pine beetle infestation across parts of the state.

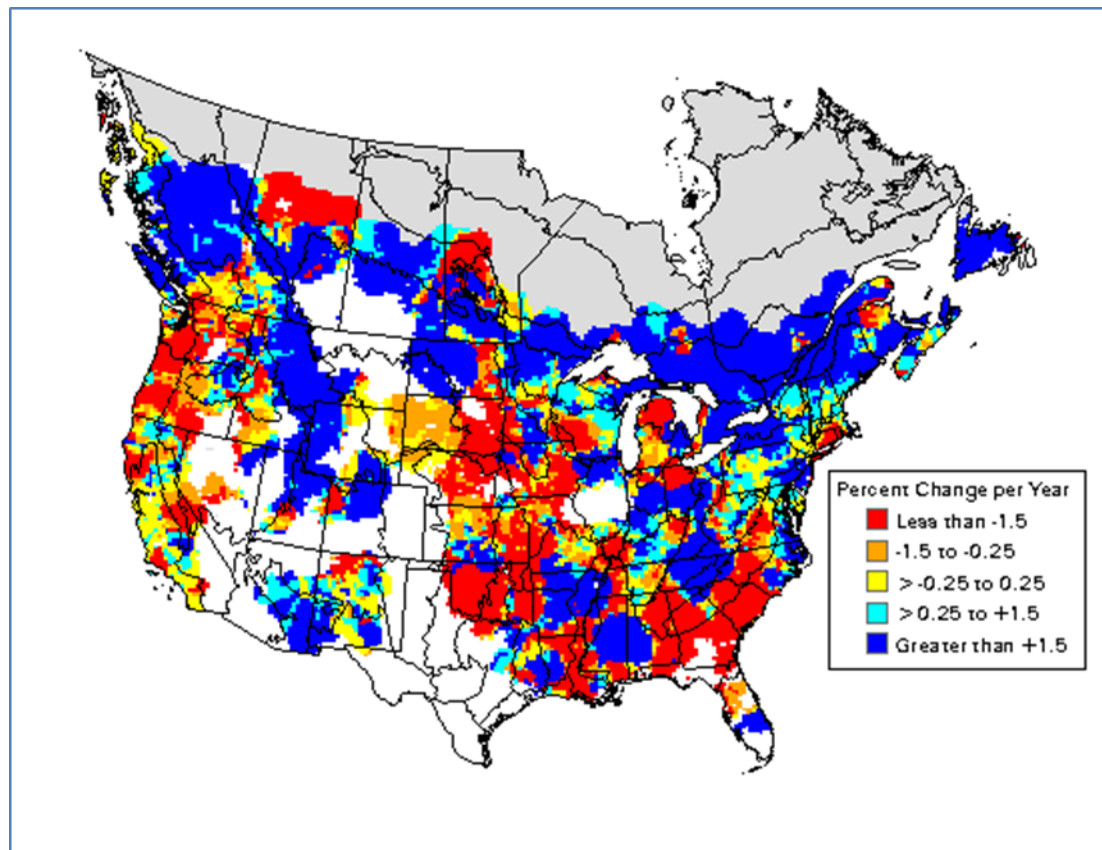


Figure 72. Average percent change per year in population trend for hairy woodpeckers, 1966-2013, across the 48 contiguous states and the Canadian provinces (Sauer et al. 2014)

Hairy woodpeckers can be found with regularity in any forest habitat with dead trees for nesting and enough insect-prone trees to provide feeding substrate (Hutto and Young 1999, p. 22). In the Tennile – South Helena project area, hairy woodpeckers have been observed in mature lodgepole pine, spruce/subalpine fir, Douglas-fir, ponderosa pine, mixed conifer, and aspen stands; in young forest and cutting units (including clearcuts) with residual snags and older trees; in wetland and riparian shrub associations; and, with great frequency, in the new snag dominated environments created by the mountain pine beetles.

Extensive wildlife surveys by Helena NF biologists (1992-2013) and point-count surveys by the Northern Region Landbird Survey Program (1994-2006) indicate that the hairy woodpecker was regularly present in the Divide landscape prior to the mountain pine beetle outbreak in 2006 and that it is now common in the beetle-impacted forests. There are numerous hairy woodpecker observations within the project area (see point observations export from Montana Natural Heritage Program, retrieved on May 29, 2015, from <http://mtnhp.org/mapviewer/>).

Williamson's Sapsucker

Williamson's sapsucker (*Sphyrapicus thyroideus*) is identified as a bird of conservation concern (USDI FWS 2008) in Bird Conservation Region 10 which includes the Tenmile – South Helena project area. As noted in NatureServe Explorer (2015), habitat for Williamson's sapsucker includes middle to high elevation montane and subalpine coniferous forest (including spruce-fir, Douglas-fir, western larch, lodgepole pine, and ponderosa pine), and also mixed deciduous-coniferous forest with quaking aspen (Cannings et al. 1987, Campbell et al. 1990, Dobbs et al. 1997). Williamson's sapsuckers nest in tree cavities excavated in dead or decaying pine, fir, larch, or aspen (Terres 1980). Suitable nesting snags generally are more common in old forests than in younger ones. This woodpecker drills holes in trees and consumes sap and phloem fibers. It also consumes insects and fruits. Nestlings primarily eat ants, while adults consume wood-boring larvae (e.g., beetles), moths of spruce budworms, flies, and aphids (Dobbs et al. 1997).

The Montana Natural Heritage database lists the global status of Williamson's sapsucker as G5: "Common, widespread, and abundant (although it may be rare in parts of its range), not vulnerable in most of its range". (<http://fieldguide.mt.gov/displayClasses.aspx?Kingdom=Animalia>). In Montana its status is S4B - Apparently secure, though it may be quite rare in parts of its breeding range, and/or suspected to be declining.

Breeding Bird Survey (BBS) data for North America indicate a stable trend for the period 1999-2009 and a nonsignificant increase for the period 1966-2009 (NatureServe Explorer 2015) (Figure 73). However, BBS trend data for Williamson's sapsucker is not considered very reliable for this species as it is hard to detect, detected in very low abundance, and BBS transect coverage of this species' range is not very good. There is one Williamson's sapsucker observation in the project area in 2010 and one just southeast of the project area on private land in 2013 (see point observations export from Montana Natural Heritage Program, retrieved on May 29, 2015, from <http://mtnhp.org/mapviewer/>).

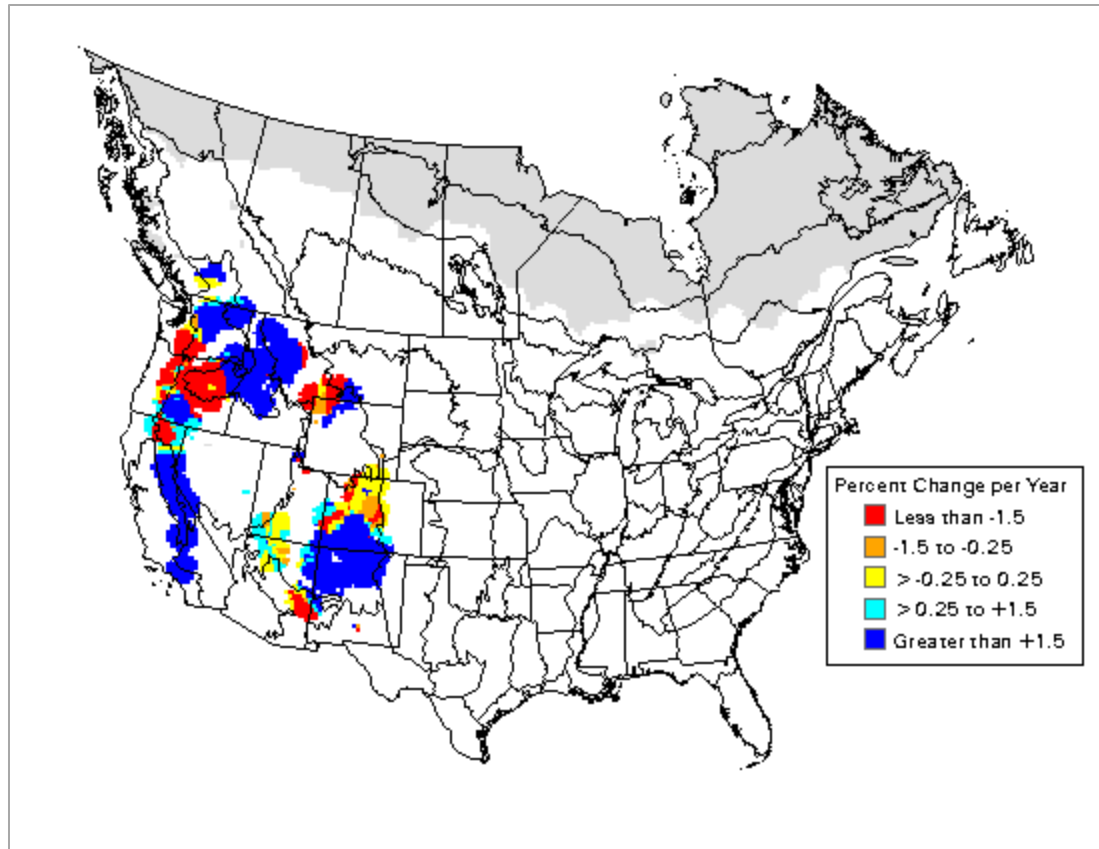


Figure 73. Average percent change per year in population trend for Williamson's sapsuckers, 1966-2013, across the 48 contiguous states and the Canadian provinces (Sauer et al. 2014)

Marten

The marten (*Martes americana*) is the Helena Forest Plan management indicator for mature forest habitats. High quality habitat for marten consists of moist, structurally complex, mature forest with moderate to high crown closure and a generous component of large dead trees and logs (Buskirk and Ruggiero 1994). Stumps and coarse woody debris are critical habitat components that provide for foraging, resting, and denning (Coffin 1994; Spencer 1987). Snags are sometimes used as overnight dens during severe winter weather (Ruggiero et al. 1994). Chapin et al. (1997) found that vertical and horizontal structure of the forest was more important than age or species composition. Drier, younger, or more open-canopied forests with few dead trees and uncluttered understories do not provide marten with the key habitat components they need to readily find prey, den, and survive the winter (Coffin et al. 2002, p. 13-14). These stands, however, do provide forested connectivity between preferred habitats. Connectivity habitat of this sort may be provided by mature stands of dry Douglas-fir, lodgepole pine, and whitebark pine or by pole-sized stands of any conifer species. This discussion will focus primarily on the snag and down woody debris component of marten habitat.

Overhead cover is a key habitat element for marten. They are usually considered to be an "interior forest species" in that they do best when patches of mature forests are large and non-linear (Hillis et al. 2003). They may be sensitive to patch size and they generally avoid large, uncluttered openings such as meadows and new clearcuts. The probability of marten using abundant coarse woody debris with little overhead cover, as would be

produced by insect or disease outbreaks, is unclear. While most studies suggest that the complexity of physical structure near the ground (such as provided by coarse woody debris) is the most important limiting factor for marten (see, for example, Andruskiw et al. 2008), the fact that marten avoid non-forested habitats suggests that overhead cover is a primary limiting factor (see, for example, Buskirk and Ruggiero 1994). The “jackstraw” piling up of dead trees (≥ 6 inches dbh) would provide much more complex near-ground cover for resting, breeding, and foraging than would the “clean” understories provided by most mature lodgepole pine stands.

Marten are not easily monitored because their population densities are low [0.3 to 6.6 marten per 10 square miles in Montana (Coffin et al. 2002 p. 23-28)] and they spend most of their time in structurally complex habitats where they are difficult to detect. It is known, however, that they are found throughout the Divide landscape wherever suitable habitat occurs—primarily in mid-high elevation forests dominated by subalpine fir, Engelmann spruce, and lodgepole pine with pockets of coarse woody debris. Marten are rare in lower elevation ponderosa pine and dry Douglas-fir forests (Ruggiero et al 1994, p. 22), although these habitats sometimes provide linkage between forests suitable for long-term occupancy

Evidence for the presence of marten has come from regular winter tracking surveys south of Highway 12 by Montana Fish Wildlife and Parks, from more recent tracking surveys in the little Blackfoot watershed by Wild Things Unlimited (Gehman 2006-2012), and from observations during general wildlife surveys over the last 18 years (Helena National Forest wildlife observation files). These observations are insufficient to derive population parameters but they give a general picture of marten distribution and habitat use and show that marten population densities are low throughout much of the landscape. This is a function of a number of factors: past trapping, a relative abundance of naturally unsuitable habitat (dry ponderosa pine and Douglas-fir forest, dry grassland), a predominance of mature and pole-sized forest not yet old enough to provide prolific large woody debris (a function of historic fire patterns and past timber harvest), natural and human-induced fragmentation of optimal habitat sites, and inherently low population densities regardless of habitat conditions.

The Montana Natural Heritage database lists the global status of marten as ‘G5’—defined as “common, widespread, and abundant (although it may be rare in parts of its range), not vulnerable in most of its range”. The statewide status is ‘S4’, which is “apparently secure, though it may be quite rare in parts of its range, and/or suspected to be declining” (See <http://fieldguide.mt.gov/displayClasses.aspx?Kingdom=Animalia>).

There are two marten observations in the southwest of the project area, and more sightings in the western portion of the Divide landscape where habitat is more plentiful (see point observations export from Montana Natural Heritage Program, retrieved on May 29, 2015, from <http://mtnhp.org/mapviewer/>).

Marten require large snags, stumps, and logs for resting, natal denning, and foraging. They utilize a variety of standing dead trees when foraging but they are more strongly associated with larger snags for denning (Coffin 1994; Forest Carnivore Species Team 1995). While snags in the 7-11.9 inch diameter size class are now abundant in the project area (Table 118), few are available in larger size classes (~7 per acre 12-19.9 inches

diameter), and none are available in the >20+ dbh size class (see also Forest Vegetation Report). Preferred levels of down woody debris range from 10 to 20 tons per acre (Warren 1990); generally greater than 10 tons per acre for den sites and greater than 20 tons per acre for foraging. The amount of down wood, primarily in areas with pine species, has increased as snags created by the pine beetle have begun to fall. The downed wood includes larger logs as pine beetle preferentially selects larger trees. In the lodgepole vegetation type fuel accumulation is estimated to be between 40 and 80 tons per acre (see Forest Vegetation Report).

Environmental Consequences

Effects to snags and down wood are evaluated with the following measures:

- Acres treated that remove snags
- Acres treated that remove down wood

Desirable Habitat Conditions

- ✓ A variety of size and decay classes
- ✓ Well-distributed

Effects Common to All Alternatives

Under all alternatives, natural processes and disturbances at all scales will continue to create snags. Public firewood cutting is permitted and could reduce the snag resource adjacent to roads. Large untreated areas would remain on the landscape where snag creation and attrition processes would be undisturbed. In the long term, snags are likely to become rare as the current “snag pulse” is lost to natural attrition. Additionally, while lodgepole pine snags are abundant, snags of other species and of large size are limited.

The rate at which snags fall and become dead wood varies and may be related to the speed of bole decay at the ground level (Mitchell and Preisler 1998). Attrition may also vary by tree species. According to Smith (2000), ponderosa pine snags that result from MPB infestation may fall within the decade where there is a lack of factors that make these snags durable. Another study found that beetle-killed ponderosa pine begin falling at a rapid rate after year 5, and most of the fall occurs between years 5 and 12 (USDA 2000a). However, in the Tennmile – South Helena project area, most of the newly created snags are lodgepole pine. In a study done on MPB-killed lodgepole pine, dead trees began falling 3 years after death in thinned (more open) stands and 5 years after death in un-thinned stands. Ninety percent had fallen by year 12 and 14 respectively and no particular year had a higher rate of fall than average once trees had begun to fall (Mitchell and Preisler 1998). Trees may fall sooner in more open stands because more wind can penetrate, and/or because more sunlight speeds up bole decay (Mitchell and Preisler 1998). Similar results have been found in fire-killed lodgepole following the Sleeping Child burn, where an average of 13.4 percent of the snags studied fell yearly (Lyon 1977). Due to the current limited age class diversity, after the snags created by this MPB outbreak fall there will be few lodgepole snags until the forests regenerate, mature, and begin to die again. This “pulse” cycle is consistent with stand-replacing disturbance regimes. However because there is also living Douglas-fir, spruce, and subalpine fir, some snag creation should occur through time to partially reduce the loss of current snags.

The current pine beetle epidemic is changing potential habitat patterns for pileated woodpecker, hairy woodpecker, Williamson’s sapsucker, and marten in the project area

and across the Divide landscape. Currently there are a large number of snags in the 7 to 19 inch size classes (77 per acre), and an increasing level of down wood across the project area. In areas dominated by pine species the increase in snags and down wood is pronounced. The snags have begun to weaken and fall, decreasing the number of standing snags and increasing the amount of down wood. The snags created by the mountain pine beetle outbreak are expected to fall within the next decade. Because of the slow rate of decomposition of downed wood in drier climates, downed wood levels are expected to remain high unless consumed by a fire. In the long term, there will be a lack of snags across the landscape in pine dominated stands as it will take 100 years or longer for trees to establish, grow to large sizes, and begin to die and create new snags.

Pileated woodpecker foraging habitat (snags and down wood) is available, in pine dominated areas, within the project area at high levels. In spruce and fir dominated portions of the landscape foraging habitat is available at natural levels. Nesting habitat has always been scarce in the Tenmile – South Helena project area due to lack of trees and snags greater than 20 inches dbh. The availability of nesting habitat is not altered under any alternative as large snags will be maintained where they exist. Foraging habitat will continue to be provided by down wood over time.

Hairy woodpeckers are not limited by nesting habitat, but by their insect food supply. Nesting habitat is abundant in the project area. Food, in the form of mountain pine beetles, has decreased since 2009 and likely the numbers of hairy woodpecker in the project area are also declining. Although the amount of nesting habitat would decrease as snags falls, it is unlikely to affect hairy woodpecker numbers. Insect populations would be maintained in the future at reduced levels and would maintain a smaller hairy woodpecker population.

Williamson's sapsucker habitat is found in mid- to high-elevation conifer forests. In areas dominated by ponderosa and lodgepole pine the amount of foraging and nesting habitat has increased. As snags continue to fall, the habitat would diminish. Habitat would continue to be provided in the spruce and fir dominated areas, while habitat would no longer be available in pine dominated areas. It would be many decades before remaining pine habitat grows old enough to again provide nesting habitat (snags) for this sapsucker.

Marten would use the increased number of snags at the mid- to high-elevations for foraging and resting areas. If these snags occur in areas with little to no canopy cover remaining (pure pine stands), marten would likely avoid use of the area. In areas with some canopy remaining, as the snags fall they would provide critical foraging and denning habitat. The down wood providing the foraging and denning habitat would remain available far into the future unless consumed in a fire. Down wood has been limited in the past due to large scale fires in the late 18th and early 19th centuries. The current increase in down wood habitat provides more opportunity for marten in the project area than in the past. It is unknown how the increased denning habitat would improve marten use of the area.

Effects Common to All Action Alternatives

Snags would be reduced in proposed harvest units and maintained or increased in burning units. Snags outside of treatment units would be unaffected in the short term aside from ongoing public firewood gathering and natural creation/attrition. Creation of snags in some untreated areas may be lessened to some degree due to the alteration of fire behavior across the project area. Enhancing vigor and resilience of treated areas may provide for snag recruitment into the future after the current pulse of snags from fires and insects have been lost through natural attrition.

Under the action alternatives, snags would be managed through the design of un-treated areas, retention of live trees for recruitment in treated areas, and setting snag retention goals in treated areas. In harvest units, contractors are required to fall any tree they identify as a safety hazard (OSHA Instruction CPL 2-1.19). However, retention goals would be included in prescriptions; if a snag designated for retention must be removed for safety, it would remain onsite as coarse woody debris and a substitute snag selected for retention. No retention of individual dead lodgepole pine is desired; these trees are generally small diameter and not windfirm. Some groups or clumps of lodgepole snags may be left in inoperable areas or when mixed with other retention trees. All whitebark pine snags would be retained unless they pose a specific safety or operability concern. In regeneration harvest units, roughly 20 snags per 10 acres from a mixture of diameter classes available, with seral species preferred, and all snags >20" dbh would be retained. In intermediate harvest units, the goal would be to retain all snags greater than 20" dbh; and additional snags to average at least 2/acre of the largest and most windfirm snags available, or as many are available less than that. There would also be abundant live trees in various size classes retained for snag replacement as well as inoperable areas and buffers in units where snags would be retained. Snags are more likely to be retained in units with group shelterwood treatments because they are less likely to pose a safety hazard. Snags remaining in units would no longer be surrounded by a closed forest. As such, wildlife use is expected to shift from one suite of species associated with closed canopy forests (brown creepers, squirrels) to species associated with open canopies (bluebirds, flickers). For some, use would not change (chickadees, hairy woodpeckers).

Snag recruitment is anticipated from proposed prescribed fire, based on prescribed mortality goals. The target overstory mortality in burn units varies (See Forested Vegetation Background Report). For example, mortality goals are generally low in regeneration harvest units because the remaining trees are desirable for seed, shelter, and/or structural diversity. Mortality goals are higher in broadcast burns in areas not harvested. In prescribed fire prescriptions, specifications would generally include limiting cutting of snags >12" diameter during pre-fire preparation unless they are a specific safety or line containment hazard.

Timber harvest will affect pileated woodpecker habitat. Nesting habitat should be minimally affected, however, since treatments are designed to retain large trees and snags within units. Specifically, intermediate harvest and group shelterwood treatments would generally retain stand structure suitable as nesting habitat. Other treatments such as shelterwoods and seedtree regeneration will retain some nesting habitat in the form of legacy trees left on site as part of the tree retention guidelines. Clearcut treatments with reserve trees generally will not retain nesting habitat. Large snags would be left intact in

all harvest units except where they pose a safety hazard. Snags remaining in units would no longer be surrounded by a closed forest, and therefore nest habitat effectiveness would be reduced.

Timber harvest is expected to reduce future foraging habitat for pileated woodpeckers since treatment objectives include reducing stand susceptibility to insects and disease. The MPB outbreak has now subsided, largely due to host depletion and has progressed out of the outbreak phase in general, but should remain on the landscape in endemic quantities. Meanwhile the Western spruce bud worm (WSB) is now moving into the project area in greater concentrations than was seen in the past. WSB is actively defoliating Douglas-fir, spruce, and subalpine fir, contributing to stress which can predispose stands to beetles. Treatments associated with the action alternatives are designed to reduce stand vulnerability (Bulaon and Sturdevant 2006).

Prescribed fire could further reduce foraging opportunities for pileated woodpeckers. Research (Bull et al. 2005) indicates that charred logs may result in fewer ants which in turn results in decreased foraging opportunities for pileated woodpeckers. The action alternatives included prescribed fire. Where this overlaps with potential pileated woodpecker habitat, foraging habitat could be impacted. In other instances, incidental mortality of trees associated with burning could produce future nesting habitat.

Timber harvest could result in the removal of hairy woodpecker habitat depending on the treatment type. Commercial thinning will generally retain stand structure suitable as hairy woodpecker habitat while other treatments such as group shelterwood, shelterwood, and seedtree will generally remove hairy woodpecker habitat but will retain some structural components in the form of legacy trees left on site as part of the tree retention guidelines. Regeneration treatments with reserve trees generally will not retain habitat. Snags would be managed according to Forest Plan Standards.

Timber harvest may reduce future foraging opportunities for hairy woodpeckers since treatment objectives are to reduce future stand susceptibility to insects and disease. However, since a large portion of the project area will remain untreated, stands that have high levels of insect infestations will remain in the project area. Prescribed fire could promote nesting habitat due incidental mortality of trees associated with burning.

Timber harvest would remove marten habitat under both action alternatives. Intermediate harvest is expected to retain some features of marten habitat such as requisite canopy cover (greater than 25 percent) and stand size as described in the Criteria for Wildlife Models Helena National Forest (USDA 2009a). Regeneration harvest is not expected to retain marten habitat.

Prescribed fire in the action alternatives should result in the creation of some snags and subsequent down woody debris habitat by killing trees. Small fuels would be consumed through underburning but these fuels are currently not limited on the landscape and are of lesser importance to marten than the larger down wood.

Studies have indicated that snags and down wood are important habitat components for martens as cover, rest sites, den sites, under snow structures, and hunting (Bull et al 1999). Standing dead trees would be left intact in all harvest units to meet Forest Plan

standards except where they pose a safety hazard. Snags are more likely to be retained in group shelterwood and prescribed burn treatments because they are less likely to pose a safety hazard in those units. Design elements are also in place to protect large down wood.

Alternative 1

Direct/Indirect Effects

The availability of dead wood habitat is expected to increase under the no action alternative as described above under the effects common to all alternatives. As described in the Forest Vegetation Report, “existing high density forests could be replaced by fire or bark beetles.” Low level disturbances in most cases will provide a variety of snag and down wood habitat. However, future widespread wildfire and epidemic insect and disease outbreaks would compromise the ability of the project area to provide dead wood in the long term. More dead and dying wood would accumulate in the short term, increasing habitat as described under effects of all alternatives.

Due to the current limited age class diversity, after the snags created by this MPB outbreak fall there will be few ponderosa pine or lodgepole pine snags until the forests regenerate, mature, and begin to die again. This "pulse" cycle is consistent with stand-replacing disturbance regimes. However because there is also living Douglas-fir, spruce, and subalpine fir, some snag creation should occur through time to partially offset this loss.

No Action Alternative Cumulative Effects

While there can be no cumulative effect from no action being taken, a discussion of the likely trajectory of the snags and down woody debris in the project area may prove beneficial. Past timber harvest (Appendix E, Table E-1, Wildlife Report) most likely removed many of the snags that were in the area at that time. In turn, this would have affected levels of down woody debris habitat. Today, these treatments are reflected in the existing condition which, because of the mountain pine beetle outbreak, is currently well above Forest Plan standards. Fuels activities that occurred in the past mainly focused on reducing surface fuels. These activities most likely have resulted in the creation of snags and subsequent down wood habitat.

Table E-2 of Appendix E to the Wildlife Report lists other types of past projects. These projects did not appreciably change snags and down woody debris habitat, but would have contributed to disturbance of wildlife. Table E-3 lists the present/ongoing projects. The Red Mountain Flume Chessman Reservoir Project includes removal of dead and dying trees thereby reducing snag availability (although snags remain abundant in that project area). The Clancy Unionville Vegetation Project is partially complete, with fuel treatments still being implemented. This project included thinning from below to recreate historic open-mature and old growth ponderosa pine habitats on 10 to 18 acres. These treatments should have improved habitat for pileated woodpeckers (nesting habitat).

Appendix E, Table E-4 to the Wildlife Report, lists the reasonably foreseeable activities in the project area. Disturbance during project implementation is the primary effect of the Golden Anchor Road, Tenmile Road Improvement Project, Rimini Substation, and

Minerals Operations. The Telegraph Creek MPB Salvage and Precommercial Thinning project could result in snag reductions.

Alternatives 2 and 3

Direct/Indirect Effects

Alternatives 2 and 3 would treat approximately 24,308 acres (about 40 percent) and 18,113 acres (about 30 percent), respectively, of the project area. About 60 percent and 70 percent would be left untreated (alternative 2 and 3 respectively) providing an abundance of snag habitat and live trees for snag recruitment (in Douglas-fir and subalpine fir stands). Untreated areas are well distributed and connected. Any snags in treatment units that pose a safety concern would be removed. Table 119 summarizes the effects to snag habitat according to the respective harvest treatment proposed for a given unit. Fewer snags would be lost in alternative 3 due to a reduction in the amount of acres treated.

Table 119. Effects to snag habitat by harvest treatment type

Treatment Type	Description	Acres Treated Alternative 2	Acres Treated Alternative 3
Intermediate Harvest	A stand of live residual trees is retained which provides for snag recruitment. Snag recruitment would occur to a lesser amount and/or at a slower pace after treatment because treatments are designed to increase tree vigor and lower susceptibility to mortality.	4,575	3,665
Regeneration Harvest	This treatment results in removal of most of the existing overstory. Scattered individual or patches of live tree reserves would be identified to provide seed, structure, snag recruitment, and/or species diversity. Some existing snags would be retained within reserve patches, or as scattered individuals.	4,234	2,449
Prescribed Fire	Few snags would be felled in these areas, limited to those necessary for safety and fire containment purposes. Prescribed fire follows harvest (intermediate or regeneration) as well. Target overstory mortality in burning areas would vary depending on objectives, ranging from fuel reduction to site preparation for regeneration. In all cases, some snag creation is expected.	15,028	11,552
Precommercial Thinning	These areas were previously harvested and generally contain few to no snags. The treatment is focused on thinning young trees. There would be little to no impact on snags; if they occur, they would be retained.	471	445
TOTAL		24,308	18,112

The portion of the project area that would remain untreated would continue to support adequate snag densities and linkages between snag patches. The Forest Vegetation

Report determined that between 34 and 194 snags per acre would remain post implementation in alternative 2 and between 35 and 196 snags per acre in alternative 3.

Management activities can have substantial effects on snag density and longevity (Wisdom and Bate 2008; Russell et al. 2006). Exploring the density of snags in wilderness and roadless areas can provide insight to natural snag abundance and distribution on the Forest which in turn can help to explain and understand the differences between areas that have been influenced by management and unmanaged areas. Table 120 (excerpted from the Estimates of Snag Densities for Eastside Forests in the Northern Region [Bollenbacher et al. 2008]) summarizes the distribution of snags by size class and habitat type that occur within and outside of wilderness areas. These data are presented in order to give the project a Forest-wide context prior to and after implementation of either of the action alternatives.

Table 120. Mean snag density per acre* inside and outside of wilderness/roadless areas by snag analysis groups for the Helena national forest (based on regional grid data)

Area	Dominance Group	Habitat Type Group	Snags per Acre 10"+	Snags per Acre 15"+	Snags per Acre 20"+
In Wilderness/ Roadless	All Other Groups	Warm	3.6	0.6	0.1
		Cool	17.3	2.1	0.7
		Cold	21.5	2.2	0.5
	PICO	All	9.2	0.4	0.0
Outside Wilderness/ Roadless	All Other Groups	Warm	2.1	0.7	0.3
		Cool	11.8	3.8	1.5
		Cold	No data		
	PICO	All	5.4	0.3	0.0
*Size class categories presented in this table do not directly compare to <i>Forest Plan</i> categories except in the 20"+ class.					

The number of snags remaining post implementation far exceeds the snag densities reported for areas within Wilderness/Roadless Areas (3.6 to 21.5 snags per acre 10 inches or greater) or outside Wilderness/Roadless Areas (2.1 to 11.8 snags per acre 10 inches or greater) on the Helena National Forest (Bollenbacher et al. 2008) prior to the mountain pine beetle epidemic. Although the Forest Plan snag categories are not directly comparable to those in the table above, it's clear that the current snag levels in the project area are well above those present in unmanaged – wilderness – landscapes. So, despite snag losses associated with harvest treatments in the action alternatives, snag levels project-wide would continue to exceed those found both within and outside of wilderness areas. In other words, there are currently more snags present in the project area due to the mountain pine beetle than would be expected based on Forest-wide conditions and there would continue to be ample numbers of snags in the project area even in light of treatments associated with alternatives 2 and 3.

Furthermore, treatment versus non-treatment areas should result in a diverse spatial arrangement of snags in the long term. Untreated areas will continue to unravel in the lodgepole pine dominated stands as trees killed by the mountain pine beetle fall to the forest floor. These untreated areas will provide for both clumpy and dispersed snags in a variety of forest conditions. Treated areas will encompass a mosaic of untreated patches and harvested areas. There is a benefit to having both dispersed and patches of snags and down wood on the landscape.

Some data suggest that different harvest treatments yield different use by secondary and primary cavity users (Bunnell et al. 2002). Dispersed retention of snags and trees favors secondary nesters compared to mature and old forests. Large patches of snags favor primary cavity nesters. Secondary cavity nesters appear to be more common in areas of timber removal. This may be attributed to the fact that many secondary nesters are more effective at foraging in open areas. Treated versus non-treated stands in the project area, as well as different harvest treatment prescriptions, should create a variable pattern of snag distribution within the project area.

Primary excavators tend to occur more in aggregated patches perhaps due to the fact that this is the natural distribution associated with insect and disease patterns. Bunnell et al. (2002) found that partial harvest did not affect the abundance of primary nesters in most cases. In some cases, abundance increased perhaps due to small openings and creation of edges. Therefore, effects to primary excavators will not be as pronounced in intermediate harvest treatment units relative to those in regeneration harvest treatment units.

Approximately 43 miles of temporary road construction would occur under alternative 2 and 24 miles of temporary road under alternative 3. All roads would be closed to the public and decommissioned post-activities. There are no anticipated effects to snags associated with firewood retrieval on these roads.

Pileated woodpecker foraging habitat would be affected on approximately 47 percent (11,583 acres) of the project area under alternative 2, assuming that precommercial thinning would not affect foraging habitat. Alternative 3 would result in the reduction of 28 percent (5,066 acres) of pileated woodpecker habitat. This is not anticipated to effect pileated use of the project area, as the amount of foraging habitat is at an unnaturally high level. Also, as nesting habitat is limited in the Tennmile – South Helena project area there is limited opportunity for pileated woodpeckers to establish territories here. Snag retention requirements will maintain the largest snags available in treated areas therefore maintaining any potential nesting sites.

Snags for hairy woodpecker nesting would be removed within the treated areas of the project, particularly within intermediate and regeneration harvest units. However, nesting habitat is abundant across the landscape and food supply is the determining factor for hairy woodpecker use. Proposed activities would remove some insect habitat (green trees, snags, down wood); however, pine beetle numbers in the analysis area have already declined and insect prey will continue to be available across the landscape. Hairy woodpeckers would be maintained in the project area at levels their food supply can support.

Williamson's sapsucker habitat would decline in the project area over time; however snag habitat would be removed in treated areas sooner than if no action was taken. Habitat would continue to be provided in the spruce and fir dominated areas, while habitat would no longer be available in pine dominated areas. It would be many decades before remaining pine habitat grows old enough to again provide nesting habitat (snags) for this sapsucker, just as if no action was taken. However, Bunnell et al. (2002) found that partial harvest did not affect the abundance of primary nesters in most cases. In some cases, abundance increased perhaps due to small openings and creation of edges.

Marten would use the increased number of snags at the mid- to high-elevations for foraging and resting areas. According to the Forest Vegetation Report, just about 35 percent (approximately 8,528 acres) of the proposed treatment areas occur in the mid- to high elevations in lodgepole pine and mixed conifer stands under alternative 2. Under alternative 3, about 28 percent (5,158 acres) would be treated. Because of marten's preference for areas with canopy cover, removal of snags in treatment areas that lack canopy, as is the case in much of the dead lodgepole, would not affect marten use of the area. In areas with some level of canopy cover, loss of snags can impact foraging and recruitment of denning habitat. However, Intermediate harvest treatments should retain some characteristics of marten habitat. Allowing light to penetrate the forest floor will increase forest floor production and understory, resulting in an increase in small mammal habitat as more niches become available to small mammals. The down wood providing foraging and denning habitat would remain available far into the future unless consumed in a fire. Down wood has been limited in the past due to large scale fires in the late 18th and early 19th centuries, therefore the increased down wood habitat increased the habitat available to marten from historic levels. It is unknown how the increased denning habitat would impact marten use of the area.

Action Alternatives Cumulative Effects

Cumulative effects are the incremental impacts that the direct and indirect effects associated with the action alternatives have on snag and down woody debris habitats in the context of the myriad of other past, present, and future effects on these habitats from unrelated activities. The cumulative effects analysis considers spatial and temporal boundaries, how past activities have contributed to the existing condition, and whether the ecosystem can accommodate additional effects. Table 121 summarizes the key items that are taken into consideration for the cumulative effects analysis for snag and down woody debris habitats. See also Appendix E to the Wildlife Report, Cumulative Effects, for more information.

Table 121. Cumulative effects considerations for snag and down woody debris habitat in the project area

Parameter	Discussion
Spatial Boundary	The spatial boundary is expanded to the point at which snags and down woody debris habitats are no longer measurably affected. The project area satisfies this requirement because this is the scale at which the effects to these habitats can be examined at the stand or treatment unit. The project area also provides a sufficient landscape to assess pattern and structure in the context of larger processes.
Temporal Boundary	The temporal boundary ranges from the 1950s (due to a lack of earlier records in the FACTS database) to those future projects that are either listed in our SOPA or are planned or implemented on private land within the Project boundary.
Past Activities and Existing Condition	The effects of past activities are reflected in the existing condition. Past activities shaped the age class, density, and species composition of the snag and down woody debris habitats that comprise the project area today. The existing condition, which incorporates the changes due to past activities, has been measured by remote sensing and field validation.
Activities Considered in Cumulative Effects	<p>Past activities that are included in the cumulative effects analysis include timber harvest (hazard tree removal as well), fuels activities, and private land timber harvest.</p> <p>Ongoing and future activities include the Red Mountain Flume/Chessman Reservoir project, personal fire wood cutting, the Divide Travel Plan, and private land timber harvest.</p>
Measurement Indicators	Measurements include effects to snag and down woody debris.
Thresholds	Forest Plan standards of a minimum of 2 snags per acre by 3 rd order drainage.
Methods	Past, ongoing, and reasonably foreseeable activities are described quantitatively based on acres of forested habitat affected. Impacts of past activities are based on the FACTS database and summarized according to the types of treatments recorded in the database. The effects on forest habitat are based on observed changes to stand structure.
Assumptions	The assumptions for describing past and foreseeable treatments are made based on terminology described in FACTS since these definitions are standardized.

Past Activities

Past timber harvest (Appendix E, Table E-1, Wildlife Report) most likely removed many of the snags that were in the area at that time. In turn, this would have affected levels of down woody debris habitat. Today, these treatments are reflected in the existing condition which, because of the mountain pine beetle outbreak, is currently well above Forest Plan standards. Table 122 summarizes the effects of timber harvest during three time periods on snags and down wood currently existing in the project area.

Fuels activities that occurred in the past mainly focused on reducing surface fuels. These activities most likely have resulted in the creation of snags and subsequent down wood habitat.

Table 122. Past Forest Service timber harvest activities and their impacts on the availability of snags and down wood habitat in the cumulative effects analysis area.

Decade	Harvest Type	Acres	Effect
Forest Service Timber Harvest Pre-1960s through 1970s	Regeneration Harvest	489	Although no pre-harvest data exist on snag levels, it's probable that most snags that were present at the time were removed during timber harvest. This is reflected in the existing condition. Down woody debris was also most likely removed during timber harvest. Alternative 1 would not remove any snags; Alternatives 2 and 3 would remove snags adding to the effects of past harvest.
	Intermediate Harvest	3	
Forest Service Timber Harvest 1980s through 1990s	Regeneration Harvest	335	
	Intermediate Harvest	104	
Forest Service Timber Harvest 2000 to Present	Regeneration Harvest	637	
	Intermediate Harvest	531	

Table E-2 of Appendix E to the Wildlife Report lists other types of past projects. These projects did not alter snag and down wood habitat, but would have contributed to the disturbance of snag associated wildlife.

Ongoing Activities

Ongoing activities that have effects to snag and down woody debris habitat are summarized in Table 123.

Table 123. Ongoing activities that may impact snag and down wood habitat

Activity	Effects to Snags and Down Woody Debris Habitat
Firewood Cutting and Post & Pole Permits	Ongoing firewood cutting and post & pole permits result in removal of snags along roadsides and reduces snag availability in those locations (Bate <i>et al.</i> 2007).
Private land timber harvest	Private land logging will continue to remove snag and down wood habitat.
Red Mountain Flume/Chessman Reservoir	The Red Mountain Flume/Chessman Reservoir project is primarily removing dead trees – snags – along the Chessman Reservoir and Flume; however, Forest Plan standards for snags are being met with this project.

Table E-3 of Appendix E to the Wildlife Report, lists the present/ongoing projects. The Clancy Unionville Vegetation Project is partially complete, with fuel treatments still being implemented. Additional snags may be removed and created with fuel treatments; however the number of snags per acre would not be noticeably altered. The remaining ongoing activities primarily result in disturbance to snag and down wood dependent species in localized areas.

Reasonably Foreseeable Activities

The private lands capable of supporting forests within the eastern portion of the project area are dominated by Douglas fir and ponderosa pine. Private lands in the western portion are dominated by lodgepole pine, either mature trees or seedling/sapling stands that are the result of regeneration harvest in recent decades. Nearly all of the mature trees have succumbed to mountain pine beetle, much of which has been salvage logged. Because the sawtimber component that is economical to remove has been removed and

because the balance of the lands are at least 50 years from again producing saw logs, it is likely that there will be very little if any harvest on the private lands within the project area for the next five decades. Private lands within the combined boundary but outside of the project area are a mix of lodgepole pine-dominated stands with a similar history and lower elevation stands dominated by Douglas-fir. Much of the lower elevation component has also been subject to past timber harvest, but there is the potential for reasonably foreseeable harvest. However, the level and timing of this harvest is uncertain.

Implementation of the Divide Travel Plan, pending a decision, would result in several miles of road closures that would preclude firewood retrieval in most cases (exceptions include opening some of these areas to firewood gathering on a limited basis as needed to address fuel loading concerns). Conversely, the roads that would remain open under the Divide Travel Plan would continue to be used for firewood gathering; however, since this is already ongoing, the impacts to snags, and down wood habitat, would remain the same as the current situation along these open roads.

Appendix E Table E-4 to the Wildlife Report, lists the Reasonably Foreseeable Activities in the analysis area. Disturbance during project implementation is the primary effect of the Golden Anchor Road, Tenmile Road Improvement Project, Rimini Substation, and Minerals Operations.

Cumulative Effects Conclusions for the Action Alternatives

Implementation of alternative 2 or 3 would contribute to the effects associated with past timber and fuels activities that have partially defined the existing condition by both removing snags through timber harvest and adding them through prescribed burning. Alternatives 2 and 3 would also contribute to the effects associated with the following ongoing and reasonably foreseeable projects: private land timber harvest and development, the Red Mountain Flume/Chessman Reservoir project, firewood retrieval, and the Divide Travel Plan. However, due to the abundance of snags in the project area, overall cumulative effects to snag and down wood habitat are expected to be minimal.

Irreversible and Irretrievable Commitment of Resources

There are no irreversible or irretrievable commitments of resources.

Conclusions

In the short-term, alternative 1 retains the highest levels of snags needed by pileated and hairy woodpeckers and for Williamson's sapsuckers. Alternative 2 would result in fewer remaining snags compared to alternative 3 because more acres overall would be treated in alternative 2, which could affect woodpecker nesting and foraging habitat. Given that the project area's post-treatment snag density would remain relatively high and the largest snags would be retained in treatment units unless they pose a safety risk, the actual impact of the action alternatives on pileated and hairy woodpeckers and Williamson's sapsuckers is likely to be minimal. Alternative 1 would put future marten habitat at risk by leaving heavy fuel loads in the project area. Under conditions favorable for catastrophic fire, fire would result in mature stands reverting back to early seral conditions and restoration of marten habitat would take several decades.

Under the action alternatives, snag and down woody debris would continue to be abundant and well-distributed in the project area regardless of which action alternative is chosen. Clearly, alternative 2 removes more snags than alternative 3; however, snags are not limited in the project area. A variety of size and decay classes would continue to occur across the project area.

Design elements are in place to ensure adequate levels of snags and down woody debris. These include:

- In regeneration harvest units, roughly 20 snags per 10 acres from a mixture of diameter classes available, with seral species preferred, would be retained where they do not pose a safety or feasibility concern. All snags >20" dbh would be retained. There would be a few reserve trees/patches and inoperable areas to provide snags and/or replacement trees.
- In intermediate harvest units, snag retention goals would be to retain all snags greater than 20" dbh; AND 7 ponderosa pine or Douglas-fir snags greater than 10" dbh, or as many are available less than that amount, where they do not pose a safety or feasibility concern. There would also be abundant live trees in various size classes retained for snag replacement (75-300/acre).
- A retention of 5 tons/acre of down woody debris (greater than 3 inch diameter) following treatments in warm, dry forested habitat types and a minimum of 10 tons/acre in all other forest types would ensure adequate habitat for down woody debris-dependent species (i.e., marten).

Populations of pileated woodpecker, hairy woodpecker, Williamson's sapsucker, and marten as well as other cavity-nesting species known to occupy the project area appear viable. (See Affected Environment and Viability Analysis). It follows that, in general, snag levels are currently adequate to sustain those species known to occur in the project area. Furthermore, data collected elsewhere on the Helena National Forest in an area of similar mountain pine beetle-related tree mortality (albeit predominantly ponderosa pine) indicate that nest success of some woodpecker species nesting in that area has increased since the mountain pine beetle outbreak.

Forest Plan Consistency

Forest Plan standards (Forest Plan p. II/21-would be adhered to in all action alternatives (See Forest Plan Consistency section). These include:

- To keep an adequate snag resource...snags should be managed at 70 percent of optimum (average of 2 snags per acre) within each 3rd order drainage. There are five 3rd order drainages associated with the project area - 1001-1, 1001-2, 1001A, 0814, and 0809C; post treatment snags in alternative 2 would be 78, 91, 194, 58, and 34 snags per acre respectively and more so under Alternative 3. The standard is met.
- Management areas other than T-1 should be the primary source for snag management. However, if adequate snags cannot be found outside of T-1, then the following numbers and sizes of snags should be retained in cutting units, if available. (A) In units with snags, keep a minimum of 20 snags and 10

replacement trees per 10 acres, if available. If 20 snags are not available, then any combination totaling 30 should be left by the following dbh classes: 13 snags and 6 replacement trees from 7-11 inches; 5 snags and 3 replacement trees from 12-19 inches; and 2 snags and 1 replacement tree 20+ inches. In alternative 2, 60 percent of the project area will be left untreated; in alternative 3, 70 percent will be left untreated – in other words, an abundance of snags will remain in the project area post implementation of either alternative.

The pileated and hairy woodpeckers are management indicators for old growth dependent species; the marten is a management indicator for mature forest species. As such they are intended to be a bellwether of the effects of management activities on representative wildlife habitats with the objective of ensuring that viable populations of existing native and desirable non-native animal species are maintained.

Federal laws and direction applicable to management indicator species include the National Forest Management Act (NFMA), the Forest Service Manual, and the Helena National Forest Plan. The NFMA requires the Forest Service to “provide for diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives” [16 USC 1604(g)(3)(B)]. All alternatives are consistent with this requirement. Pileated and hairy woodpecker habitat and marten habitat would continue to be abundant and well-distributed and species’ viability would be maintained across the Forest. See also the Viability Analysis in Appendix D to the Wildlife Report.

Forest Plan standards also applicable to pileated and hairy woodpeckers and martens are those that provide thresholds for snags.

Habitat Fragmentation

Affected Environment

The Nature of Fragmentation

Habitat fragmentation occurs when a given habitat—forest, grassland, shrubland—becomes partitioned into smaller disjunct patches either by natural means (such as conifer colonization in grasslands or fire in forests) or by human enterprises (such as logging, settlement, or road building). Classic fragmentation of mature forest habitat results from timber harvest, fire, insect irruptions, or other sources of deforestation creating swaths of unforested habitat so large as to leave only islands of functioning forest. The creation of new clearings in a mature forest stand does not necessarily represent forest “fragmentation”. In fact, as long as the openings are surrounded by larger masses of forest, it is the openings that are the fragments. But if the process continues, the openings may become so all-encompassing that remnant forest patches become poorly connected or isolated from one another and the microclimate within them is altered (Saunders et al. 1991). In a fragmented forest landscape, interior forest species have difficulty moving between different parts of their habitat, and the patch size and suitability of the forest environment may be diminished to the point that local population viability of dependent species is threatened (Rosenberg et al. 1997).

This model of fragmentation derives from the theory of island biogeography (MacArthur and Wilson 1967): it focuses on the size of remnant forest patches and the distance

between patches as the key factors that determine the fitness of the resident forest wildlife populations. More recent scrutiny, however, suggests that the character of the habitat “matrix” that surrounds the forest remnants can ameliorate the effects of fragmentation for many forest species (Kupfer et al. 2006; McIntyre and Hobbs 1999). Unlike true ocean islands, which are separated by a permanently hostile milieu, forest patches are set in a matrix of terrestrial habitat of varying congeniality for forest wildlife. Intervening environments are often “variegated” to an extent that they can be regularly crossed by many forest species. Suitability of the matrix can be enhanced by mature trees scattered about or in patches, groups of younger trees and shrubs, riparian/wetland habitat, robust ground cover, connectivity via forest stringers, and short distances between the forest remnants. In addition, a majority of forest patches are enveloped by open habitats that are in the process of regenerating to new forest: that is, the matrix is evolving and does not represent a permanent barrier. In this view, the landscape as a whole is the “continuum”, and conditions in the matrix have as much to do with how suitable the landscape is for forest species as does the character of the forest itself (Debinski 2006).

The degree to which the juxtaposition of different habitat structures across the landscape is perceived as “fragmentation” or a useful habitat mosaic depends, as well, on the species involved. A landscape with a complex matrix of mature conifer forest, new clearcuts, sapling thickets, aspen clones, burns, and dry parks may limit habitat opportunity for certain mammals and birds (red-backed voles, red squirrels, fishers, brown creepers, goshawks, meadow voles, meadowlarks), but it may provide a good habitat mix for more wide ranging habitat generalists (elk, mule deer, moose, black bears, grizzly bears, bobcats, wolverines, robins, Townsends solitaires) (Debinski 2006; McIntyre and Hobbs 1999).

On the Helena NF, most roads and other human developments of similar scale tend not to physically fragment habitat so much as to create zones that repel wildlife species wary of human activity. The end result for some species is that animals confine much of their activity to smaller, less optimal blocks of habitat and, as with structural fragmentation, they move between blocks of undisturbed habitat under duress. One study of road and powerline corridors through forest habitat (Rich et al. 1994) concluded that interior forest birds did not perceive narrow forest-dividing corridors—road corridors 25-50 feet wide—as sources of forest fragmentation. They did not avoid the edges but they were susceptible to cowbird nest predation in those areas.

Openings created by timber harvest, on the other hand, may be perceived as sources of fragmentation if they are wide enough and surround enough of the forested area. Clearcuts and seed-tree cuts, in particular, can eliminate whole blocks of interior forest habitat replacing them with open environments that can be problematic for some forest-dependent forest species for several decades. The new unforested clearings and the early-seral forest habitats that follow favor a different association of wildlife species—those adapted to “open” environments, edges, ecotones, or mosaics of early/late seral forest. These species may then compete with interior forest dwellers in zones

Historically, natural forces that broke up the continuity of the mature forest included fire, insect and disease outbreaks, winter-kill, flooding, landslides, wind-shear events, and so on. Wildfire and insect infestation—the most common agents of transformation—often

razed mature forest over extensive areas (thousands of acres) rather than in the patchworks typically generated by timber harvest. This was not so much forest fragmentation as broadscale community replacement (temporary though it might be), and it presented local wildlife associations with a set of circumstances quite different from those that arise from a more fine-grained honeycomb of mature forest spotted with openings.

Habitat in the Divide Landscape and the Project Area

Timber harvest has partially fragmented mature forest in a number of local areas of the Divide landscape over the last few decades, but its primary effect in most places has been to break up parts of the forest continuum into a mosaic pattern rather than to create an assortment of isolated forest remnants. The effects (positive and negative) have been appreciable for some species, but the process has not produced the kind of true fragmentation that imperils species population viability.

The Tenmile – South Helena project area is a typical example of how timber harvest has modified forest habitat in the landscape. Between 1960 and 2014, approximately 14 percent of the project area was logged via regeneration harvest methods, creating new openings totaling about 8,389 acres in the mature forest continuum. Most of these cutting units are less than 40 acres in size. These units are reasonably well dispersed across the entire project area, producing a landscape dominated by mature forest but perforated by early-seral forest openings. The acreage of older forest has decreased and forest edge and ecotone have increased, but viable connections between blocks of mature forest have been retained [Figure 74].



Figure 74. A view from Jericho Mountain of upper Mike Renig Gulch and the Continental Divide. Mature forest is the dominant vegetation formation, but its continuity is broken by an array of old clearcuts and, to a lesser extent, by natural grasslands. Clearcuts date from the 1960s through the 1990s: those visible here range in size from about 15 to 40 acres and are full of sapling conifers (averaging 12-18 feet tall). This mosaic of mature forest and regenerating

openings is typical of the project area. While the mature forest continuum is interrupted, forest connectivity is maintained. As can be seen in this 2012 view, much of the mature forest canopy is dead in the wake of the pine beetle outbreak, and true forest fragmentation lies ahead.

Mature forest has remained the dominant habitat formation in the project area but now, because the diversity of habitat structure has increased, so have the habitat opportunities for a variety of wildlife species. The mature forest continuum has been made more porous, but it has not been fragmented in a way that has threatened the viability of resident interior forest wildlife or lowered diversity (as described by Kupfer et al. 2006). The presence throughout the area of species such as elk, mule deer, moose, wolverines, lynx, black bears, grizzly bears, mountain lions, wolves, bobcats, goshawks, great gray owls, blue grouse, snowshoe hares, and a full complement of the common songbirds, raptors, woodpeckers, and small mammals indicates that the area is functioning as a non-fragmented landscape. Local problems have arisen in a number of areas where a combination of newly cleared forest habitat and open roadways have elevated human disturbance in sites lacking cover. Some of these problems have been addressed by road closures; others have been ameliorated over time by regrowth of forest in the openings.

Currently, the primary agent of mature forest fragmentation in the project area and across the Divide landscape is the mountain pine beetle. Follow-up salvage operations may accentuate the effect in some areas, but, with or without the supplementary harvest of dead trees, the beetles have already done the work. Because of its scale, the beetle-kill will produce genuine fragmentation and wholesale replacement of mature forest communities across large sections of the landscape. Stands of younger pine (regenerating clearcuts) and of mature non-pine species (Douglas-fir, Engelmann spruce, subalpine fir, aspen) will serve to break up the new continuum of dead pine trees. It needs to be emphasized, however, that in most cases, this fragmentation is temporary: beetle-impacted areas will begin the process of regenerating toward mature forest as soon as site conditions allow.

Environmental Consequences

There are no specific indicators used to analyze the effects of the alternatives to habitat fragmentation. Effects are qualitative. Fragmentation, for the purposes of this analysis, includes only human-caused fragmentation.

Desirable Habitat Conditions √ Naturally fragmented landscapes and interior forests are maintained within the project area
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Effects Common to All Alternatives

There are no effects with regards to fragmentation that are common to all alternatives other than succession and natural disturbance processes that would continue to shape landscape patterns. These successional changes will influence the juxtaposition of forested and non-forested patches, the result of which is a shift in the spatial arrangement of openings and forested stands over time. Most wildlife species should be able to handily adjust to these shifts in landscape patterns except in those situations where change is sudden (e.g. wildfire).

Effects Common to All Action Alternatives

Timber harvest and prescribed fire in the action alternatives would create openings in those stands that are either predominantly dead (i.e. lodgepole pine) or dense with thick understories (i.e. Douglas-fir). These activities would result in a reduction of habitat for species that prefer dense, interior, forested environments (e.g. brown creepers) or for species taking advantage of the structure afforded by the standing dead trees (e.g. hiding cover for elk). Conversely, these activities would result in an increase in habitat for species that prefer more open stands. Species that utilize a wide range of forest structure would remain unaffected. Species associated with edges and ecotones would find new habitat opportunities. Wildlife species composition would vary from one stand to another depending on the number of trees per acre that remain post-treatment. Canopy cover, vertical structure, and hiding cover would decrease while understory vegetation, visibility, and sub canopy flyways would increase.

Lack of fragmentation in the interior west is more of an issue than fragmentation. Forested landscapes are not a national priority for conservation or a priority at the ecosystem level in the Northern Region (Samson 2005, p. 17). In the past, fire and topographic diversity in the west together produced a temporally dynamic, naturally fragmented landscape. Because western populations of wildlife have a long association with naturally fragmented forested landscapes, as a group, they may be less impacted by forest fragmentation at some spatial scales (Dobkin 1994, Hutto 1995). In managed forests, timber harvest is the major method of regenerating forested stands to create multiple-aged forests on a landscape, because large-scale wildfires are mostly prevented. A timber harvesting practice that might cause a relatively great short-term change from pre-harvest conditions may be integral to long-term strategy for maintaining populations of all wildlife species, especially in areas that experience frequent and wide spread disturbance (Hutto et. al. 1993, Hejl et al 1995).

The brown creeper warrants additional consideration since it is an animal species of concern according to the Montana Natural Heritage Program (accessed on June 6, 2015). Brown creepers are strongly associated with late successional stages of coniferous forests and in Montana they are more common in spruce-fir and mixed-coniferous forests (Hutto and Young 1999). Studies in the Rocky Mountains indicate that creepers tend to be less abundant in logged (clearcut and partial logged) versus unlogged forests (Hejl et al. 1995). In an extensive survey throughout the northern Rocky Mountains, creepers were two times more abundant in old-growth than in mature forests, rare in young, partial cut, patch cut, and pole-sapling stands, and absent from seed-tree and recent clearcut openings (Hutto and Young 1999). No old growth would be treated under any action alternative. However, implementation of any of the action alternatives would create conditions that are unsuitable for brown creepers – i.e. logged forests.

Alternative 1

Direct/Indirect Effects

In the short term, ecosystem processes that shape the project area will continue to unfold; areas affected by the mountain pine beetle will continue to unravel creating openings crisscrossed with downed trees. In the long term, closed canopy forests would increase in portions of the project area unaffected by the mountain pine beetle as open forests fill in

with understory trees and early seral stands proceed towards maturity. Over time, wildfires could create large blocks of open habitat with standing snags. The juxtaposition of forested and non-forested areas will continue to be in flux. Wildlife in the project area should be able to adjust habitat use and distribution patterns as long as the vegetative changes proceed relatively slowly.

No Action Alternative Cumulative Effects

While there can be no cumulative effect from no action being taken, a discussion of the likely trajectory of habitat fragmentation may prove beneficial. As the mountain pine beetle runs its course in the project area and Divide landscape, forested stands will revert to early seral stages as mature trees die creating conditions similar to those created by past timber harvest and fire. These open areas will continue to be avoided by interior forest obligates. Road use that is the result of past management decisions will continue to impact animals that avoid roads.

Alternatives 2 and 3

Direct/Indirect Effects

Intermediate timber harvest and prescribed fire would result in the creation of open-canopied forests. Wildlife associations would shift from those species preferring closed, interior forests to those preferring open-canopied forests and ecotone habitats (e.g. mule deer). Species like the brown creeper that are associated with late-successional forests will experience a decrease in habitat where treatments are proposed in stands that are unaffected by the mountain pine beetle. Treatments proposed in stands that have been affected by the mountain pine beetle would result in openings some of which exceed 100 acres. Some wildlife species would avoid openings of this size while other species may make use of the subsequent regeneration (e.g. snowshoe hare). After a decade or so, the same pattern of open forest and non-forested habitat will have formed in the surrounding untreated areas (albeit with abundant woody debris). This fragmented formation will develop whether or not the action alternatives are carried out. The action alternatives only serve to hasten the development of this landscape pattern. Eventually (> 50 years) mature forests should once again become the dominant habitat formation in the project area. Meanwhile, viable connections between blocks of mature forest would be retained thereby facilitating movement patterns and habitat use in the project area.

Action Alternatives Cumulative Effects

Cumulative effects are the incremental impacts that the direct and indirect effects associated with the action alternatives have on habitat fragmentation in the context of the myriad of other past, present, and future effects on these landscape features from unrelated activities. The cumulative effects analysis considers spatial and temporal boundaries, how past activities have contributed to the existing condition, and whether the ecosystem can accommodate additional effects. Table 124 summarizes the key items that are taken into consideration for the cumulative effects analysis for habitat fragmentation. See also Appendix E to the Wildlife Report, Cumulative Effects, for more information.

Table 124. Cumulative effects considerations for habitat fragmentation

Parameter	Discussion
Spatial Boundary	The spatial boundary is expanded to the point at which habitat fragmentation is no longer measurably affected. The project area satisfies this requirement because this is the scale at which the effects to landscape patterns can be examined at the stand or treatment unit. The project area also provides a sufficient landscape to assess pattern and structure in the context of larger processes.
Temporal Boundary	The temporal boundary ranges from the 1950s (due to a lack of earlier records in the FACTS database) to those future projects that are either listed in our SOPA or are planned or implemented on private land within the Project boundary.
Past Activities and Existing Condition	The effects of past activities are reflected in the existing condition. Past activities shaped the arrangement of edge and ecotones as well as the availability of contiguous blocks of habitat that comprise the project area today. The existing condition, which incorporates the changes due to past activities, has been measured by remote sensing and field validation.
Activities Considered in Cumulative Effects	Past activities that are included in the cumulative effects analysis include timber harvest, fuels activities, and private land timber harvest.
	Ongoing and future activities include the Divide Travel Plan and private land timber harvest.
Measurement Indicators	Measurements include effects to fragmentation, edge, and ecotones
Thresholds	There are no specific thresholds; effects are qualitative.
Methods	Past, ongoing, and reasonably foreseeable activities are described quantitatively based on acres of forested habitat affected. Impacts of past activities are based on the FACTS database and summarized according to the types of treatments recorded in the database. The effects on forest habitat are based on observed changes to stand structure.
Assumptions	The assumptions for describing past and foreseeable treatments are made based on terminology described in FACTS since these definitions are standardized.

Past Activities

Several past activities never had or no longer have present effects to which the project would contribute. Other projects that involved vegetation manipulation (e.g. timber harvest and fuels activities) created patterns still evident on the landscape today. Table 125 summarizes the effects of timber harvest during three time periods in the project area. Areas that were treated in the 1960s are beginning to develop mature stand characteristics. Areas more recently harvested have yet to achieve this condition.

Fuels activities that occurred in the past mainly focused on reducing surface fuels. Many of these areas that were treated prior to the 1980s have returned to their ‘pre-treatment’ conditions especially in favorable growing conditions that accelerate understory development. Fuels activities that have occurred since the 1980s have also reduced surface fuels and created more open conditions that favor shrub and grassland development.

Table 125. Past Forest Service timber harvest activities and their influence on habitat fragmentation in the project area

Decade	Harvest Type	Acres	Effect
Forest Service Timber Harvest Pre-1960s through 1970s	Regeneration Harvest	489	Forested habitat that was regenerated during this time currently comprises pole size trees (5-10" dbh). Intermediate harvest treatments that occurred during this time are now open grown stands with developing understories. The effects of timber harvest on fragmentation are still present today in the project area.
	Intermediate Harvest	3	
Forest Service Timber Harvest 1980s through 1990s	Regeneration Harvest	335	Forested habitat that was regenerated during this time currently comprises young sapling sized trees (up to 5" in dbh). Intermediate harvests have resulted in stands that are open grown today with larger trees; however the understories aren't as developed as those areas treated at an earlier time. The effects of timber harvest on fragmentation are still present today in the project area.
	Intermediate Harvest	104	
Forest Service Timber Harvest 2000 to Present	Regeneration Harvest	637	Forested habitat that was regenerated at this time is currently in the stand initiation phase and in some instances large trees may remain (e.g. shelterwood or seed tree harvests). The effects of timber harvest on fragmentation are very pronounced today in the project area.
	Intermediate Harvest	531	

Ongoing Activities

Ongoing activities that may exacerbate habitat fragmentation include private land development, especially rural home building which is making it more difficult for animals to move through the landscape. Problems also come from new and upgraded roads, mining operations, ATV-trail bike riding areas, private timber harvest, clearing of vegetative cover from riparian sites, and paving of the Rimini road. Other ongoing projects that could contribute to habitat fragmentation include the Red Mountain Flume/Chessman Reservoir project and the Clancy Unionville project.

Reasonably Foreseeable Activities

Activity on private land within the cumulative effects area that is expected to continue in the future and that may contribute to habitat fragmentation includes: settlement and associated development of private lands (including road building); timber harvest and removal of beetle-killed dead trees; and continued mining operations that usurp habitat and create disturbance zones.

Reasonably foreseeable activities on the Helena NF that may lead to and/or offset habitat fragmentation include the Tennmile Road improvement project and the Divide Travel Plan. The Divide Travel Plan would result in the closure, at least seasonally, of several miles of roads that are currently open. This would be beneficial to a variety of wildlife

species. Where roads remain open, the effects of the existing fragmentation associated with those roads would remain in place.

Cumulative Effects Conclusions for the Action Alternatives

Implementation of alternative 2 or 3 would contribute cumulatively to the effects associated with past timber and fuels activities. Specifically, the project area would become more open in the short term and edge would increase while stands regenerate and develop understories. Alternatives 2 and 3 would add to the effects associated with the following ongoing and reasonably foreseeable projects: private land timber harvest and the Divide Travel Plan.

Irreversible and Irretrievable Commitment of Resources

There are no irreversible or irretrievable commitments of resources.

Conclusions

The action alternatives – more so in alternative 2 than 3 - will open up closed-canopied forests and produce temporary non-forested openings (in regeneration harvests in lodgepole pine stands). Stands that are thinned may fragment contiguous blocks of mature forest. The action alternatives are designed to maintain forest/non-forest ecotones and avoid treatments and patterns that are inconsistent with naturally-occurring patterns. This type of forest/non-forest juxtaposition would be beneficial for elk, for example, since it provides forage opportunities but not at the expense of cover, and vice-versa (Stubblefield et al. 2006). However, because a majority of the project area will remain untreated under any action alternative, habitat should remain available in forested stands not affected by the mountain pine beetle for a variety of species that rely on large tracts of interior forest habitat - i.e. brown creepers.

Forest Plan Consistency

Forest Plan standards applicable to fragmentation are primarily those included in the respective management areas that occur within the project area. Forest-wide standards that may be applicable include standards for old growth. Since no old growth will be treated with this Project, Forest Plan standards relative to old growth are not applicable.

There are six Management Areas within the project area; of those, only two contain direction that may be applicable to fragmentation although fragmentation is not specifically identified:

- Management Area T-5 – Maintain adequate thermal and cover adjacent to forage areas, provided timber harvest volumes are not significantly reduced over the rotation period.
- Management Area W-1 – Wildlife habitat improvement practices, including road management, prescribed fire, and other techniques, will be used to maintain and/or enhance the quality of big game and nongame habitat.

These standards emphasize improvement of big game habitat of which fragmentation can be a factor. Mule deer, for example, often use edges created by fragmentation since those

areas optimize the relationship between forage and cover. Fragmentation, or thinning of forested stands, can render an area unusable by big game if those areas are devoid of screening properties or other features upon which big game depend. The action alternatives include treatments that would increase fragmentation; however, these open forests should provide a mix of forage and shade during the summer for big game. All of the action alternatives are consistent with these standards in terms of maintaining and/or enhancing big game habitat.

Continental Divide Linkage

Affected Environment

The Nature of the Resource

Corridors

A travel corridor is a pathway of hospitable habitat that allows species to move between larger, more suitable habitat blocks that are separated from one another by less congenial environments. The narrow, linear configuration of corridors results from (1) their conformity to narrow travel channels or bottlenecks presented by local topography (ridgetops, draws, passes), (2) the linear arrangement of suitable habitat components (stream bottoms, strings of drainage-head riparian sites), and (3) the general dominance of unfavorable environments on the landscape forcing certain species to pick their way through patches of suitable habitat. In addition, animals sometimes travel along relatively narrow pathways because of habitual behavior, even though there is ample opportunity to move across a broader area. This is particularly evident with herd animals such as elk (Irwin 2002, p. 498-499). Corridors may be local routes, facilitating movement of animals within their daily home ranges, or they may extend over greater distance, connecting more widely separated seasonal ranges (Rosenberg et al. 1997). But, whether serving as seasonal migration routes or as daily travel ways, corridors represent predictable pathways between key habitats, usually along the most advantageous routes available.

Some corridors, particularly local connections between forest or riparian patches, can be readily recognized by their vegetation structure and composition, which contrasts with the dominant surrounding environment (Harris 1984, pp. 141-144). Many corridors, however, are not obvious, well-defined features of the landscape that can be precisely defined by topography or vegetation. Rather, they can be defined only by following the movements of animals that make use of them over time (Servheen et al. 2003).

The effectiveness of a given corridor varies with species: the combination of habitat parameters that make a corridor suitable for an elk will be different for a lynx and different still for a mink or a red fox. Historically, the course of most travel corridors was dictated by topography, vegetation structure, the pattern of snowpack, and the availability of resources (particularly, forage, water, and cover). In the Divide landscape over the past 150 years, many routes have shifted in response to human development and to natural phenomenon, such as fire, vegetative succession, shifts in predator/prey patterns, and so on. Today, animals on the move follow the old resource/topography-driven routes where possible but divert as necessary to avoid roads and other centers of human activity [see Irwin 2002, p. 498-499]. Travel can be hemmed into well-defined

corridors wherever a combination of topography, vegetation, and human development has limited the options.

Linkage Zones

While long-distance connections between regions of suitable habitat or population refugia are sometimes referred to as “corridors”, they are usually more aptly described as “linkage zones”. A linkage zone is an array of multiple habitats—often regional in scope—through which wide-ranging species gradually move as they make their way between larger and more hospitable ecosystems (Servheen et al. 2003).

Characteristics favorable for linkage zone/corridor function for most species (especially the large carnivores and ungulates) include low open road density, low concentrations of human occupancy (as represented by occupied buildings, developed recreation facilities, mining operations), an abundance of productive foraging habitat, a robust mix of forested and non-forested habitats (abundant edge), and gentle-moderate terrain (Craighead et al. 2001; Walker and Craighead 1997; Servheen et al. 2003). In areas where these characteristics predominate, some transient species may linger for some time before moving on, taking a period of years to traverse a linkage zone and making their status as “resident” or “transient” somewhat problematic for biologists studying the role of a particular landscape.

Project Area Status

Local Connectivity

Movement routes through the Tennile – South Helena project area are numerous and diverse. Some are narrow and well-defined. These include (1) local routes that are part of a repeated daily movement regimen (such as trails leading to water or between bedding and feeding sites) and (2) routes delimited by topographic features such as drainage bottoms, narrow ridgelines, and saddles. Well-worn game trails often follow the unroaded portions of productive stream bottoms, however major portions of most primary stream corridors (Tennile Creek, Sweeney Creek, Banner Creek, Beaver Creek, Bonner Creek) are roaded in this project area, and large portions are on private land. Where roads are closed to vehicles at least part of the year (Minnehaha Creek, Black Hall Meadow, Beaver Spur, Rimini Spur, Chessman Cutoff) or vehicle use is light, they may serve as regular wildlife travel routes. Many ridgetop travelways have remained unroaded and retain historic wildlife use patterns. The project area includes two inventoried roadless areas, Jericho Mountain and Lazyman Gulch. Travel across ridges is most often funneled through saddles, some of which are roaded but many of which are not. Key saddles continue to serve as conduits for wildlife even though they have roads running through them, such as some of those on the Continental Divide.

Movements of some species, such as seasonal migrations by elk and mule deer or the long-range circuits of wolverines and grizzly bears, may be reasonably predictable in terms of the general routes they follow but are subject to multiple local variations from one year to the next. Elk moving from winter to summer range in the northern and eastern parts of the project area, for example, typically graze their way from wintering areas north of U.S. Highway 12 and west of Interstate 15 across open grasslands, eventually moving into a maze of forest, small meadows, stream bottoms, and calving

sites spread through the project area. The movements of individuals and groups in any given year will depend on local foraging opportunity, the timing of green-up, the need to locate calving sites, and impromptu events such as the arrival of predators or a human-generated disturbance in the forest.

Many of the animals traveling throughout the project area prefer to move under forest cover—elk, mule deer, moose, black bears, mountain lions, marten, porcupines—although most can navigate a more open environment as long as human interference is minimal. Some forest animals such as fishers and marten are more tightly tied to forested movement corridors than are elk, grizzly bears, and moose—species that need open habitat as well. For those species that make use of forested travelways, the current status of most movement corridors will remain relatively intact for perhaps another 3-5 years. Because many travel routes pass through beetle-killed lodgepole pine, hiding cover and then screening cover will be disappearing through the next decade. At the same time, coarse woody debris will pile up, providing some cover for smaller animals—and in some cases for larger animals—but requiring more convoluted pathways to navigate the area. As post-fire environments in lodgepole pine stands elsewhere on the Helena NF have demonstrated (the Warm Springs burn in the Elkhorn Range, for example), stands of moderate-high density can often accumulate enough deadfall to block movement by larger animals and force them to seek out diversionary routes.

Regional Connectivity: the Divide Linkage Zone

The Linkage Zone in General

The Tenmile – South Helena project area lies within what has been characterized as the “Continental Divide linkage zone” (Servheen et al. 2001), although it is also referred to as the Continental Divide “travel corridor”, “migration corridor”, or “habitat corridor” (Walker and Craighead 1997). On a regional level, it is seen as one of half a dozen connections between the Northern Continental Divide Ecosystem (NCDE) to the north and the Greater Yellowstone Ecosystem (GYE) to the south for a number of uncommon wildland species (grizzly bears, wolverines, lynx, and wolves, among them). In the Divide landscape, the linkage zone encompasses the entire breadth of National Forest lands centered on the Continental Divide (and for some species, adjacent non-Forest land). While the linkage zone is up to 25 miles wide across the Helena Ranger District, many dispersing species tend to concentrate in areas of productive habitat such as the string of drainage-head basins near the Divide or some of the primary drainage bottoms. The linkage zone does not lend itself to simple, straight-line travel: It is populated by an irregular dispersion of human development (roads, inholdings, campgrounds, ski areas, etc.) and exhibits irregular topography and fragmented groupings of favorable habitat. It thus functions as a network of smaller travelways—avenues of productive habitat, corridors of cover, zones away from human activity, paths of least resistance—along which different animals move, depending on their needs.

The Continental Divide Route through the Project Area

The Continental Divide ridge and the upper slopes on either side of it constitute probably the most prominent linkage zone pathway through the Divide landscape [other prominent pathways include the Little Blackfoot River corridor, the Ontario-Bison Creek corridor,

Telegraph Creek, and the Negro-Treasure Mountain ridge system]. The Divide ridge defines the western boundary of the Tennmile – South Helena project area for a distance of 11 miles. While it provides a route for animals dispersing over long distances, it also functions as a conduit for daily and seasonal movement for locally based species. The probability of wildlife actually encountering humans varies from one segment of the route to another, but it is generally low. Table 126 shows road and trail presence along the Continental Divide where it borders the project area.

Table 126. Forest condition and the level of human presence (as indicated by roads and trails) along the Continental Divide ridge on the western border of the Tennmile – South Helena project area.

Divide Ridge Segment	Miles	Forest and Road/Trail Status on the Ridge
Northern Segment: North of Jericho Mountain	3.3	Continental Divide National Scenic Trail (CDNST): occasional non-motorized human presence—hikers, hunters, Forest workers [see Figure 75. The Continental Divide ridge between Mike Renig Gulch and Minnehaha Creek on the west edge of the project area. The non-motorized CDNST runs through here, and the ridge is unroaded for 4½ miles between Jericho Mountain and MacDonald Pass. The area is heavily forested, but much of it with lodgepole pine now dead from beetle attack. The ridge provides a wildlife travel route, an elk calving area, and a refuge from human activity for several species. Error! Reference source not found.]. Much of the route passes through stands of beetle-killed lodgepole pine—still mostly standing. Douglas-fir is more prominent toward MacDonald Pass.
Central Segment: Jericho Mountain to Bullion Parks	2.4	A narrow jeep road (#1863) with several rough segments (part of CDNST): occasional human presence—afoot, 4wd vehicles, ATVs/motor bikes. Crossed by Forest Road #527 at its southern end; one residence at Bullion Parks. No hazard tree removal along this route, but it will soon be largely deforested as beetle-killed lodgepole pine falls.
Southern Segment: Bullion Parks to Beaverhead-Deerlodge NF Boundary	4.0	Forest Road #1863 (part of CDNST): Irregular vehicle traffic, typically light (estimate 1 vehicle/hr on summer weekdays; more on weekends and in hunting season). Sometimes used as haul route to the Luttrell mine waste repository. 3 residences at north end near where Road #527 crosses. Much of the road corridor has been opened up via the Hazard Tree Removal Project (2011-2012) prior to the trees falling of their own accord [Error! Reference source not found.] .
Far Southern End: Along the Beaverhead-Deerlodge NF Boundary	1.3	Crossed by an old 4wd road to private property, but supports no ridgetop roads or trails: human presence is rare—occasional hunters, Forest workers. Forest is a mix of lodgepole pine (dead and alive) and subalpine fir.
Total Ridge	11.0	

As can be seen in Table 126, 4.6 miles of the ridge bordering the project area (the northern and far southern segments) are essentially unroaded and support only occasional and low-key human activity. The northern segment carries the Continental Divide Trail and supports a consistent, but relatively low flow of foot traffic—mostly day hikers coming down from MacDonald Pass. Wildlife wary of humans (elk, black bears, mountain lions, bobcats) use the trail as a regular travel route, avoiding it to a certain extent during the hunting season. Further south where the project area abuts the

Beaverhead-Deerlodge NF, the ridge is crossed by a currently unused 4wd road but supports no ridgetop roads or trails. Wildlife traversing this segment of the Divide ridge would rarely encounter humans. Figure 74 in the previous section on “Habitat Fragmentation” provides a view of the Divide ridge north of Jericho Mountain: the ridge in this area is broad and almost continuously forested (though now mostly with beetle-killed lodgepole pine, as can be seen in the photo). Figure 75 provides an interior view of the forest along this part of the ridge.



Figure 75. The Continental Divide ridge between Mike Renig Gulch and Minnehaha Creek on the west edge of the project area. The non-motorized CDNST runs through here, and the ridge is unroaded for 4½ miles between Jericho Mountain and MacDonald Pass. The area is heavily forested, but much of it with lodgepole pine now dead from beetle attack. The ridge provides a wildlife travel route, an elk calving area, and a refuge from human activity for several species.

Between the two unroaded segments runs a single ridgetop road (Forest road #1863). The northern portion of the road (2.4 miles) is a narrow, irregular jeep road that receives only occasional vehicle use (the bulk of it during the hunting season). The southern portion is a more substantial Forest road that can be negotiated by most full-sized vehicles under normal conditions and that has on occasion served as a haul route for trucks bringing mine waste to the Luttrell Pit repository to the south. Be that as it may, vehicle traffic is generally light. In the past, species such as elk, deer, moose, black bears, bobcats, mountain lions, foxes, wolves, and coyotes, among others, have used the road as a regular travelway, switching to parallel routes a couple hundred feet into the forest when vehicle traffic on the road picks up. In 2011, beetle-killed lodgepole pine was cleared from a 25 - 120 foot swath on either side of the road as part of the Forest-Wide Hazardous Tree Removal Project. Recent fieldwork in this area (2012) indicates that animals still use the road as a travelway (presumably mostly at night), but that they have increased use of parallel routes off in the unlogged timber. Figure 76 illustrates the dramatic change in habitat character along this part of the Divide. Prior to this, road side forest was similar to that pictured in Figure 52. Without hazard tree removal, the road

corridor would have remained lined with standing dead and fallen trees for another 5 to 10 years. After that, it would have been lined with stacked deadfall—as would most of the adjacent forest further back from the road.



Figure 76. Roadside corridor along the Continental Divide (Road #1863) from which dead lodgepole pine was removed as part of the Forest-Wide Hazardous Tree Removal Project in 2011-2012. Animals such as elk, deer, bears, coyotes, and mountain lions still use the roadway as a travel route, but primarily at night. Otherwise they travel on previously-established parallel trails in the mostly dead timber on either side of the road corridor.

Because large blocks of forest cover are soon to be lost across the entire Divide linkage zone [note the dead tree pattern in Figure 76], changes in the way different species navigate the area along this part of the Divide apply to the entire Divide landscape. Adjustments already made by animals moving along the route shown in Figure 76 give some indication as to the nature of these changes.

Environmental Consequences

There are no specific indicators used to analyze the effects of the alternatives on travel corridors and linkage zones. Effects are qualitative.

Effects Common to All Alternatives

There are no effects with regards to travel corridors and linkage zones that are common to all alternatives other than succession and natural disturbance processes that would continue through time. These successional changes will render some areas unsuitable as corridors or linkage zones for those species associated with the existing vegetative patterns. Other species that are more general in their corridor requirements should be able to continue to move through the project area unimpeded.

Desirable Habitat Conditions

- √ Corridors and linkage zones through the project area remain connected and effective.

Effects Common to All Action Alternatives

All action alternatives would harvest timber in areas used by wildlife for dispersal, for movement between winter and summer ranges, and for daily movement between primary habitats. As a result, the closed canopied component of some of these corridors would be diminished. Nonetheless, they would continue to function as effective travelways for most species. Exceptions would be local connections between forested sites used by interior forest obligates. New openings and open-forest sites would be less suitable as local movement pathways for closed-forest species such as red-backed voles, marten, northern flying squirrels, and brown creepers.

Timber harvest would affect primarily movement corridors between big game summer and winter ranges. The opening up of forest stands are likely to alter the way in which big game animals use these seasonal corridors at certain times during the hunting season by shifting movement to other parts of the corridors to take advantage of denser timber. Alternative 3 would have less effect on seasonal movement corridors and on movement pathways between local habitats such as foraging areas, resting sites, and patches of escape cover.

Regeneration treatments are proposed mainly in stands comprised of dead and dying lodgepole pine. These stands have already lost their suitability as a corridor for species associated with a certain level of canopy cover and tree density. For some species, the removal of standing dead trees results in a reduction of ‘hiding cover’ or screening that otherwise could allow for safe passage through the project area.

Prescribed fire should have little impact on the travel patterns of wildlife in the project area. There may be some short term displacement during prescribed burning activities and shortly thereafter while the understory is re-established. However, these impacts should be minimal.

None of these changes is expected to significantly lower the effectiveness of dispersal or seasonal movement corridors, which under natural conditions support a variety of vegetation types and structures. The more open corridors are not expected to emerge as new killing zones during the hunting season because hunter access would be considerably more difficult (due to the accumulation of down woody debris associated with the mountain pine beetle). The proposed reduction of forest cover in and of itself should not lower the effectiveness of the corridors. In some cases where forage is currently limiting, effectiveness of local habitats may improve as new forage appears.

Timber harvest would have no effect on the integrity of the Continental Divide linkage zone—which relies for its effectiveness on a mosaic of forested cover and productive openings (Walker and Craighead 1997, p.7).

Alternative 1

Direct/Indirect Effects

There are no direct effects to travel corridors and linkage zones under alternative 1. The ongoing mountain pine beetle outbreak most likely has already resulted in altered travel patterns for some species. As the dead pine forests eventually fall, wildlife in the project

area will need to re-adjust movement patterns to account for open stands, lack of screening, and potential barriers created by large levels of down woody debris. The availability of travel corridors will depend on the species of interest and their requirements for movement. Over time, the availability of wildlife corridors will fluctuate with forest succession and, potentially, wildfire as these processes change the nature of these corridors temporally and spatially.

No Action Alternative Cumulative Effects

While there can be no cumulative effect from no action being taken, a discussion of the likely trajectory of travel corridors and linkage zones may prove beneficial. As the mountain pine beetle runs its course in the project area and Divide landscape, forested stands will revert to early seral stages as mature trees die creating conditions similar to those created by past timber harvest and fire. These open areas will continue to be avoided by interior forest obligates. Road use that is the result of past management decisions will continue to impact animals that avoid roads.

Alternatives 2 and 3

Direct/Indirect Effects

Timber harvest and prescribed burning will open up patches of forest habitat, and occasionally disrupt movement patterns across the landscape for certain forest obligates (northern flying squirrels, marten, red squirrels, red-backed voles). Treatments would not preclude travel through these sites, but would affect movement to a certain degree. Areas of untreated forest would remain interspersed with more treated stands, providing a variety of alternate local travel routes.

Treatments would increase sight distances and allow animals moving through the area to be seen from further away. The open stands, created by the treatments, would continue to screen large animals such as elk, deer, moose, and black bears, but only at distances of greater than 200 feet. On the other hand, the forage value of the treated areas would be higher than at present, allowing animals more opportunity to feed as they moved through. Tree removal is unlikely to deter straight-line movement by forest birds that quickly wing their way across local bits of less favorable habitat.

Approximately 43 miles of road construction would occur as part of alternative 2 and 24 miles as part of alternative 3. All roads would be closed to the public and would be decommissioned post-activities. Roads can present barriers, bottlenecks, and otherwise impede movement especially for smaller animals or animals with limited mobility. The extent to which a road acts as a barrier depends on an animal's behavior, dispersal ability, and population density. Some animals in the project area would most likely alter their movement patterns to avoid these temporary roads. Alternative 3, with fewer miles of temporary road, would cause less disruption to animal movement than alternative 2.

While project operations are on-going, species wary of human presence (bears, elk, mountain lions) will find the activity a local barrier to movement; and for a time they will need to select alternate travel routes or move through the area when workers are not present (at night, on off-days).

Action Alternatives Cumulative Effects

Cumulative effects are the incremental impacts that the direct and indirect effects associated with the action alternatives have on travel corridors and linkage zones in the context of the myriad of other past, present, and future effects on these corridors from unrelated activities. The cumulative effects analysis considers spatial and temporal boundaries, how past activities have contributed to the existing condition, and whether the ecosystem can accommodate additional effects. Table 127 summarizes the key items that are taken into consideration for the cumulative effects analysis for travel corridors and linkage zones. See also Appendix E to the Wildlife Report for more information.

Table 127. Cumulative effects considerations for travel corridors and linkage zones

Parameter	Discussion
Spatial Boundary	The spatial boundary needs to be expanded to the point at which corridors are no longer measurably affected. The Divide Landscape - South satisfies this requirement because this is the scale at which the effects to corridors can be examined at the stand or treatment unit. The Divide Landscape - South also provides a sufficient landscape to assess pattern and structure in the context of larger processes and movement in and out of the project area.
Temporal Boundary	The temporal boundary ranges from the 1950s (due to a lack of earlier records in the FACTS database) to those future projects that are either listed in our SOPA or are planned or implemented on private land within the Divide Landscape - South.
Past Activities and Existing Condition	The effects of past activities are reflected in the existing condition. Past activities shaped the age class, density, and vegetative species composition of the dry corridors that comprise the project area today. The existing condition, which incorporates the changes due to past activities, has been measured by remote sensing and field validation.
Activities Considered in Cumulative Effects	Past activities that are included in the cumulative effects analysis include timber harvest, fuels activities, private land timber harvest, grazing allotment management, the Statewide OHV Rule, and road construction and management.
	Ongoing and future activities include the Telegraph MPB Salvage Project, Divide Travel Plan, annual road maintenance, and private land timber harvest and development among others.
Measurement Indicators	Measurements include effects to corridors.
Thresholds	No threshold is applicable to this indicator
Methods	Past, ongoing, and reasonably foreseeable activities are described quantitatively based on acres of forest habitat affected. Impacts of past activities are based on the FACTS database and summarized according to the types of treatments recorded in the database. The effects on corridors are based on observed changes to stand structure. Impacts are also described qualitatively.
Assumptions	The assumptions for describing past and foreseeable treatments are made based on terminology described in FACTS since these definitions are standardized. Past, ongoing and future vegetation treatments and road management are expected to change the nature of corridors depending on extent of these activities and the wildlife species in question.

Past Activities

Several past activities on the Forest may have affected habitat connectivity and the way animals move through the landscape. Actions that have improved connectivity and habitat quality in the Divide linkage zone include: implementation of the Statewide OHV Plan (USDA and USDI BLM 2001), which prohibits riding off established motor routes; a variety of trail relocation projects that have removed trails from sensitive wildlife areas likely to serve as local movement corridors to upslope locations; mine reclamation projects that have improved the functioning of riparian habitats likely to attract animals moving through a linkage zone; grazing allotment revisions that have generally reduced cattle numbers and improved habitat condition; and road and motor trail closures associated with timber harvest projects (Clancy-Unionville, Sound Wood, Mullan Pass, Lava Mountain, Treasure Mountain).

Activities that have reduced effectiveness of connectivity or had a mixed impact (negative for some species, positive for others) include: timber harvest that has created large clearcuts (Bison Creek, Mike Renig-Hahn Creek, Deadman Creek, Slate Creek,

Ophir Creek-Cave Gulch, Lump Gulch, Lava Mountain, Mullan Pass); road permits allowing access across Helena NF land to private holdings; retention of recreational residences on Helena NF land (as at MacDonald Pass); small mining operations (under the 1872 Mining Act); construction and maintenance of power lines and communications sites; Forest road improvement projects that have widened road corridors; and fencing associated with grazing allotments that can impede movement by some animals.

Recently, harvest of snags from the mountain pine beetle outbreak have created “clean” openings in the forest, whereas natural processes eventually would have produced openings full of large woody debris. Most of these projects have been along roads and at developed recreation and administrative sites, and so have had little impact on unroaded habitat. Most recently, the Red Mountain Flume-Chessman Reservoir project—on both National Forest and private land—has been removing dead trees from a broad corridor along the flume and around the Reservoir in the upper Tenmile drainage. The project has been mostly completed on private lands, but is ongoing on the Helena NF. Table 128 summarizes effects of past Forest Service timber harvest on travel corridors and linkage zones.

Table 128. Past Forest Service timber harvest activities and their influence on travel corridors and linkage zones in the Divide Landscape - South

Decade	Harvest Type	Acres	Effect
Forest Service Timber Harvest Pre-1960s through 1970s	Regeneration Harvest	4,080	Forested habitat that was regenerated during this time currently comprises pole size trees (5-10" in size). Intermediate harvest treatments that occurred during this time are now open grown stands with developing understories. Past harvest treatments have resulted in forested conditions that are open which in turn has resulted in increased sight distances. This allows animals moving through the area to be seen from further away. Initially, this may have complicated movement for some species by causing them to alter travel to avoid human activity. In some places, vegetation has grown back to the point that these areas can once again be used as corridors for species that need thick cover.
	Intermediate Harvest	264	
Forest Service Timber Harvest 1980s through 1990s	Regeneration Harvest	3,220	Forested habitat that was regenerated during this time currently comprises young sapling-sized trees (up to 5" dbh). Intermediate harvests have resulted in stands that are open grown today with larger trees; however, the understories aren't as developed as those areas treated at an earlier time. Impacts of timber harvest during this time period to corridors are similar to those described for the pre-1960s through the 1970s.
	Intermediate Harvest	465	
Forest Service Timber Harvest 2000 to Present	Regeneration Harvest	1,089	Forested habitat that was regenerated at this time is currently in the stand initiation phase and in some instances large trees may remain (e.g. shelterwood or seed tree harvests). These areas provide corridors only for those species associated with young, open forests.
	Intermediate Harvest	1,977	

Ongoing Activities

Ongoing activities that have effects to travel corridors and linkage zones include private land development, especially rural home building which is making it more difficult for animals to move through the landscape. Problems also come from new and upgraded roads, mining operations, ATV-trail bike riding areas, private timber harvest, clearing of vegetative cover from riparian sites, and paving of the Rimini road. Other ongoing projects that could disrupt wildlife movement include the Red Mountain Flume/Chessman Reservoir project and the Clancy Unionville project.

Reasonably Foreseeable Activities

Activity on private land within the cumulative effects area that is expected to continue in the future and that may affect travel corridors and linkage zones includes: settlement and associated development of private lands (including road building); timber harvest and removal of beetle-killed dead trees; continued mining operations that usurp habitat and create disturbance zones (most notably, the Montana Tunnels mine expansion); continued ATV and other motorized activity.

Reasonably foreseeable activities on the HLCNF that may affect travel corridors and linkage zones include the Tenmile Road improvement project, Divide Travel Plan and the Telegraph Vegetation Project. The Divide Travel Plan would result in the closure, at least seasonally, of several miles of roads that are currently open. This would be beneficial to a variety of wildlife species. Where roads remain open, wildlife movement patterns have most likely already been adjusted. The Telegraph Vegetation Project could result in large openings that could cause animals to shift their movement patterns.

Cumulative Effects Conclusions for the Action Alternatives

Implementation of alternative 2 or 3 would contribute to the effects associated with past timber and fuels activities. Specifically, the project area would become more open in the short term while stands regenerate and understories develop. All of these activities have or will create open stand conditions that complicate movement for some species by causing them to alter travel patterns. However, a large portion of the Divide Landscape - South will remain untreated; this should provide alternate routes for travel. Alternatives 2 and 3 would also contribute to the effects associated with the following ongoing and reasonably foreseeable projects: paving of the Rimini road, private land timber harvest, travel plan implementation, the Tenmile/South Helena Project, and annual road maintenance. These ongoing and reasonably foreseeable projects along with implementation of either alternative 2 or 3 may cause short-term, temporary disruptions to animal movement but should not impede passage due to the availability of adjacent untreated areas. Alternatives 2 and 3 would also contribute to the impacts associated with annual road maintenance. Cumulatively, these activities may temporarily disrupt animal movement. Travel plan implementation, however, should offset impacts associated with alternatives 2 and 3 because it will result in the creation of large, unroaded areas that should reduce the amount of travel animals need to meet their requirements.

Irreversible and Irretrievable Commitment of Resources

There are no irreversible or irretrievable commitments of resources.

Conclusions

Connectivity is important because it allows animals to move between different habitats to meet their daily and lifetime needs as well as mitigate problems associated with fragmentation (Noss 1987). It also allows for repopulation of unoccupied areas. Reduced movement results in empty habitats or habitats that have smaller populations than they can actually support. This increases the risk of local extinction in that area and subsequently results in a lower regional population and lower long-term population persistence (Gilpin and Soule 1986). This also could increase isolation and result in decreased gene flow.

Deleterious effects associated with lack of connectivity are not well understood. The scientific debate over the need for corridors demonstrates the extent of the problem (Walker and Craighead 1997). However, there is agreement that habitat connectivity can contribute to long-term species survival (Noss 1983, Noss 1992, Noss et al. 1996).

In the short term under the action alternatives, wildlife species may have to adjust their movement patterns to take advantage of untreated areas. Given that harvest and prescribed burn patterns would match historical patterns; these anticipated shifts would be no greater than what animals would typically do after small to moderate-sized natural disturbances. However, alternative 3 probably has the least effect to existing movement corridors at least in the short term because fewer acres are treated, hence less disturbance.

The temporary road construction associated with the action alternatives could create barriers to some animal movement for the duration of the project and until those roads are reclaimed which further exacerbates the effects of the existing road network. However, unroaded portions of the project area should provide additional areas for animal movement. Implementation of alternative 3, with the fewest miles of temporary road construction, would have the least impact.

The biggest threats to animal movement in the vicinity of the project area are associated with non-federal activities such as subdivisions, highway use, and other activities that create inhospitable areas for movement within the Divide Landscape - South.

Forest Plan Consistency

There are no specific Forest Plan standards – other than the Northern Rockies Lynx Management Direction (see the Canada Lynx section) applicable to management of travel corridors and linkage zones.

Threatened, Endangered and Sensitive Species

The Endangered Species Act (ESA) of 1973 (along with its subsequent amendments) and the National Forest Management Act (NFMA) of 1976 provide the authority for managing threatened and endangered species on the National Forests. Species are listed as threatened or endangered by the USFWS in accordance with the ESA. An “endangered species” is one that is in danger of extinction throughout all or a significant portion of its range. A “threatened species” is one that is likely to become endangered in the foreseeable future. The ESA requires that the Forest Service (and all Federal agencies) evaluate the effects of proposed management actions on these listed species, as well as those proposed for listing, via biological assessments— the conclusions of which require concurrence from the USFWS before projects can go forward.

This report, deals with threatened, endangered, and proposed species as directed by NFMA, which requires Forests to evaluate the effects of proposed actions and their alternatives on local wildlife populations whose viability may be at risk. In addition to the threatened/endangered species (listed under ESA), NFMA also requires consideration of sensitive species (specified by Forest Service policy). Threatened/endangered/sensitive (TES) species that may be present in the project area are addressed in some detail in different sub-sections of the “Affected Environment” and “Environmental Consequences” sections. This information is then presented in condensed form in the “Biological Evaluation” summary toward the end of the report. Taken together, these segments constitute the biological evaluation required by NFMA.

The Forest Plan deals with threatened and endangered (T&E) species, both as management indicator species [discussed in later sections] and as species of special

concern to be evaluated according to specific management and recovery plans. In 1986 when the Plan was assembled, 4 species fell into this category: the bald eagle, peregrine falcon, and gray wolf (all listed as endangered) and the grizzly bear (listed as threatened). Since then, the bald eagle, peregrine falcon, and wolf have been de-listed and are now classified as sensitive species in USFS Region 1 [discussed in later sections]. The wolf is also now classified as a game species by the State of Montana. The Canada lynx, formerly a Forest Service sensitive species, was listed as a threatened species under ESA in 2000. The upshot is that the list of Forest Plan T&E species is different from the current ESA list.

Of the 2 species now listed as threatened that are known or suspected to range through the Tenmile – South Helena project area, the Canada lynx has been addressed previously as one of the “Driving Issues” and the grizzly bear is addressed below under “Prominent Issues”. The only sensitive species discussed in this section (“Prominent Issues”) is the wolverine. Other sensitive species are discussed later on as “Topics not Analyzed in Detail”.

Grizzly Bear

Affected Environment

Grizzly Bear Biology

Habitat Use, Behavior, Movements

The grizzly bear (*Ursus arctos horribilis*) is the largest carnivore in North America and one of the only animals that consistently alters the way in which humans function in wildland settings. Grizzlies are imposing, intelligent animals with both genetic and learned abilities to take advantage of the resources in their local environments, to adapt to new ranges, and to deal with environmental change, including human intrusion and habitat alteration (Jonkel 1978, p. 227).

Grizzly bears are individualistic in their habitat use and behavior. Adult males are normally solitary wanderers within extensive home ranges, which they come to know in detail (McLellan 1985). Adult females, while often tending to cubs, are also relentlessly on the move scouting out the resources needed for survival. The home ranges of adult male grizzlies are generally two to five times larger than those of adult females: average range estimated from 4 Montana populations was 71 mi² for females and 319 mi² for males (Schwartz et al. 2003, p. 566). Home ranges of adult bears overlap to a certain extent, and they vary in size and location depending on food availability, weather conditions, and interactions with other bears (USDI FWS 1993). Grizzlies may be periodically social when they congregate at food sources (whitebark pine stands, insect larvae irruptions, berry crops, fish runs), and at these times and during other encounters between individuals, a social hierarchy dictates behavior within the local population (Craighead et al. 1995, p. 109-154; Jonkel 1978, p. 234-236). The densities of established populations vary considerably, but they are inevitably low—an average of 102 bears/1000 mi² for 5 Montana populations (with a range of 18 – 207 bears/1000 mi²) (Schwartz et al. 2003, p. 573-574). These estimates are for core populations: densities are substantially lower in more marginal habitats and linkage zones [such as the Divide landscape].

Grizzlies, while formidably equipped as carnivores, behave basically as omnivores. The majority of their food intake consists of vegetation (green plant matter, roots, seeds), which they consume in huge quantities (Foresman 2012, p. 347). Items with high crude protein content are particularly important. As opportunistic feeders, grizzlies prey on or scavenge any animal food source that becomes available, including insect larvae, rodents, elk and moose calves, incapacitated or unwary adult ungulates, domestic livestock, and carrion of any sort. Winter-killed ungulates and other carrion are a key source of energy in spring when green vegetation is less available (Craighead et al. 1995, p. 235-237).

The search for food is a primary influence on grizzly bear movements. Upon emergence from hibernation dens in spring, grizzlies typically move to lower elevations, focusing on drainage bottoms, ungulate winter ranges, and other sites where food requirements can be met. Throughout spring and early summer most bears follow greening vegetation back to higher elevation, although some may continue to focus much of their activity in the valleys and foothills (Mace and Roberts 2012). In late summer and fall, there is a transition to more fruit and nut sources in addition to herbaceous vegetation. Seeds from whitebark pine are an important food source wherever they occur, but if they become unavailable for a time, the bears switch to other foods. Grizzlies will deviate from this general pattern, adapt to local conditions, and go wherever they need to in order to meet their food requirements (USDI FWS 1993).

While grizzly bears make extensive use of forest cover, they generally prefer to operate in a landscape with a variety of habitat formations ranging from dense interior forest to open meadowlands (Dood et al. 2006, p. 18). The bears use forested habitats for resting, general concealment, thermal relief in summer, and foraging and hunting (USDI FWS 1993, p. 7-8). They spend considerable time feeding on vegetation in more open habitats or in brushy areas along streams. They are drawn to areas with an abundance of deciduous shrubs in both forested and unforested habitats. In mountainous terrain, avalanche chutes often serve as foraging areas (USDI FWS 1993, p. 7).

Research in Alberta (Neilsen et al. 2004) and northwest Montana (Zager et al. 1983) has found that bears avoid new openings produced by forest management (typically, clearcuts) although they regularly use the edges and the forested areas adjacent to them. Once suitable forage develops in the openings—particularly if berry-producing shrubs are involved—grizzlies spend considerable time in them. Clearings that are not near open roads and are irregularly shaped so that bears are usually within 50 meters (≈ 165 feet) of cover pick up the most use. Cover does not need to be in the form of mature closed-canopy timber: tall shrubs, clumps of regenerating conifers, and leave-trees either within cutting units or around the edges allow bears to regularly travel through and forage in these areas (Neilsen et al. 2004; Zager et al. 1983).

Human Influences

Historically, grizzly bears occupied a variety of suitable habitats across much of central and western North America from northern Canada down into Mexico (USDI FWS 1993, p. 8-9). They made use of alpine environments, mountain forests, meadows, open prairies, and river bottoms stretching well out into the Great Plains. By mid-20th century, human domination of the landscape had reduced their range in the lower 48 states to pockets of well-forested montane habitat in the northern Rockies (Foresman

2012, p. 346). Five areas in this region, representing less than 2 percent of the grizzly's historic range, now support grizzly bear populations (USDI FWS 1993). Of the 5 areas, two of them straddle the Continental Divide in Montana: The Greater Yellowstone Ecosystem (GYE) and the Northern Continental Divide Ecosystem (NCDE). The Divide landscape is located partway between these large wildland ecosystems and thus is in a position to intercept any exchange between the two. Virtually all movement through the landscape is from the NCDE toward the GYE, north to south.

Field studies in the northern Rockies—Montana, British Columbia, Alberta—have lent support to the presumption that grizzly bear persistence in any given area is determined by (1) habitat quality, (2) the number of humans within that habitat, and (3) the behavior of those humans (Apps et al. 2004). Areas within historic grizzly range across the region have thus been identified in terms of the availability of large tracts of relatively undisturbed land that provide some level of security from competitive use by humans (USDI FWS 1993, pp. 1-14). To that end, 'effective' habitat is described in terms of core areas—blocks of suitable habitat free of motorized access during the non-denning period (IGBC 1994).

Research has indicated that grizzly bears, in order to avoid negative interactions with humans, underutilize habitat near roads (Apps et al. 2004; Mace and Waller 1998; McLellan and Shackleton 1989). In areas of higher open road density, this translates to considerably less suitable habitat available to the bears, which, in turn, stifles the potential for grizzly populations to increase or even persist (IGBC 1994). One of the reasons that grizzlies often avoid logged areas has more to do with the presence of new roads and the consequent increase in human activity than with the change in habitat structure (Neilsen et al. 2007; Apps et al. 2004; Zager et al. 1983). Timber harvest can improve local habitat quality for grizzlies by creating more edge and more productive foraging opportunities, but bears will seldom use these sites if they are accompanied by roads open to vehicles (Neilsen et al. 2007; Zager et al. 1983).

Ongoing research in the Northern Continental Divide Ecosystem suggests that, in spite of the grizzly's aversion to contact with humans, a substantial number of bears are now spending time outside of mountainous wilderness areas, focusing instead on the agricultural lands of the intermountain valleys and the prairies east of the Rocky Mountain Front [Mace 2014; Mace and Roberts 2012]. This research, based on tens of thousands of telemetry points, emphasizes the importance of areas with diverse and abundant food sources—be they roaded or unroaded—and the propensity of grizzlies to opportunistically move from one place to another in search of different foods, regardless of the season. Blocks of roadless habitat remain important, however, as areas where bears can avoid human activity.

With or without roads, regular human presence in occupied grizzly range increases the potential for negative confrontations. While many encounters between grizzlies and backcountry recreationists are a matter of chance, others are created by shoddy sanitation and food storage that lures bears into camps. Gut-piles left by hunters are an additional attractant that may bring bears and humans into close contact. Poor sanitation may also serve to attract grizzlies to rural cabins and other residences that they would normally avoid. In some areas, the presence of free-ranging livestock on public and private lands

provides another prey source for grizzlies, leading to ranchers calling for predator control.

Considering the gamut of human activity in grizzly country, the USFWS identifies 3 primary management elements that adversely affect grizzly bears in and around the Northern Continental Divide Ecosystem (NCDE): (1) human access management (roads and trails), (2) sanitation, and (3) livestock grazing. While other land management activities influence grizzlies, these are the 3 human generated components that produce most of the adverse effects (USDA 2013).

Population Dynamics

General Parameters

Grizzly bears are long-lived, with many individuals surviving more than 20 years in the wild. But, they have one of the lowest reproductive rates among terrestrial mammals, which precludes rapid population increase. During a female's lifetime, if she has litters of two cubs with a 50:50 sex ratio and a 50 percent survivorship of young to age 5.5 years, at best, she can replace herself with one breeding age female in the first decade of her life (USDI FWS 1993). Age of first reproduction and litter size varies and appears often to be related to nutritional state. In areas where suitable resources are less plentiful or compromised by human development and activity, the ability of local populations to multiply is limited.

The sources of natural mortality have proven difficult to quantify, but old-age, conflicts with other bears, starvation, and accidents (avalanches, den collapse) are known to be factors. Disease and parasites do not appear to be major sources of mortality (Dood et al. 2006, p. 21; Schwartz et al. 2003, p. 571). Most mortality in dependent young (cubs and yearlings) is natural, but the exact causes are often unknown because so few are radio collared. The bulk of adult mortality is human-caused: Bears are shot by hunters (accidentally, maliciously, in self-defense), killed by residents protecting themselves or their property, hit on railways and highways, or removed for management purposes (usually for killing livestock or threatening humans). Death rates in northern Rocky Mountain grizzly populations have varied dramatically over the past several decades, but in recent years, rates of mortality in the 2 large Recovery Zones [Northern Continental Divide (NCDE) and Greater Yellowstone (GYE)] have been regularly exceeded by those of surviving young—thus resulting in slow but consistent population increase (USDI FWS 2014, p. 12-23). Rates of increase/decrease in the smaller Cabinet-Yaak (CYE) population have been uneven. Population parameters in "Distribution Zones" and other more marginal areas outside of the Recovery Zones are unknown.

Population Status in the NCDE

Analysis by Mace and others (2011), based on 6 years of demographic data derived from a variety of field research, indicates that by 2009 the NCDE and adjacent areas were supporting a growing population of more than 1,000 grizzly bears. The analysis estimated annual population growth rate at about 3 percent. Annual monitoring since 2009 (Mace and Roberts 2012a, 2012b) shows that the rates of reproduction and mortality that have been producing the 3 percent growth rate are continuing. Current population numbers (\approx 1,100 grizzlies) are significantly greater than the estimate of 440-

680 bears believed to have inhabited the ecosystem in 1975 when the grizzly was listed as a threatened species.

Also, work by Kendall and others (2009) has shown that this population is characterized by high genetic diversity and is expanding its distribution beyond the NCDE in all cardinal directions. This expansion, documented by targeted survey work and many fortuitous observations in the field, led USFWS, USFS, MFWP, and IGBC biologists in 2002 to designate the northern half of the Divide landscape on the Helena Ranger District as part of a “Grizzly Bear Distribution Zone”—an area outside the Recovery Zone that was beginning to be occupied by grizzlies. Given the number of credible grizzly reports in the southern portion of the Divide landscape since 2002, the Helena NF has now extended this Distribution Zone southward to encompass the entire landscape down to the Helena/Beaverhead-Deerlodge NF boundary [USDA 2013]. In sum: research and monitoring over the last decade clearly point to a continuing “positive trajectory in population trend” in the NCDE grizzly bear population (Mace et al. 2011).

Management Direction

Regional and Interagency Grizzly Bear Committee Guidelines

The grizzly bear has been listed as a threatened species in the lower 48 states since 1975. The governing management document is the Grizzly Bear Recovery Plan, initially approved in 1982 and revised in 1993 (USDI FWS 1993). The 1993 version remains in effect today, although as bear distribution and management needs have shifted, the Recovery Plan has been clarified by more recent documents such as the Interagency Grizzly Bear Committee Guidelines (IGBC 1986), the Biological Assessment for Grizzly Bears Inside the Northern Continental Divide Ecosystem and the Grizzly Bear Distribution Zone (USDA 2005), and the Grizzly Bear Management Plan for Western Montana (Dood et al. 2006). The 1993 Recovery Plan identified seven grizzly bear ecosystems (5 currently occupied, 2 unoccupied) around which the primary recovery zones were to be centered. The intent of the Recovery Plan has been to generate viable grizzly populations sufficient to remove the bear from the Endangered Species List in each of the 7 ecosystems. The U.S. Fish and Wildlife Service felt that this goal had been achieved in the Greater Yellowstone Ecosystem in 2007, and delisted the species at that time. This action was reversed by a court ruling in 2009 (due primarily to concerns over the decline of whitebark pine as a food source) and, as a result, grizzlies remain listed as threatened in all 7 ecosystems.

The 1986 Interagency Grizzly Bear Committee Guidelines (IGBC 1986, p. 3-5) outline five “Management Situations” (MS’s), three of which (MS 1, 2, and 3) apply to areas in and around recovery zones and two of which (MS 4 and 5) apply to areas further afield. The Helena Forest Plan has mapped the areas where Management Situations 1 and 2 apply (namely, inside the NCDE Recovery Zone) but it has not done so for Management Situations 3, 4, and 5 (since their introduction post-dated the release of the HFP). The status of these latter three management situations in any given area is often in a state of flux, due to shifts in human settlement, roading, recreational activities, vegetation conditions, bear distribution, and so on. As a result, their site-specific delineation has been left to biologists at project level as needed.

Given the small number and low density of grizzlies in the Divide landscape, the management situation that most often applies (irrespective of the area's status as a Distribution Zone), is MS 5. Although the description of MS 5 in the Guidelines is an imperfect fit for much of the landscape, it comes the closest of the 5 management situations. Population and habitat conditions for MS 5 are described as follows: "Grizzlies do not occur, or occur only rarely in the area. Habitat may be unsuitable, unavailable, or suitable and available but unoccupied. The area lacks survival and recovery values for the species or said values are unknown...." (IGBC 1986). A primary element that reduces suitability of grizzly bear habitat in the Divide landscape is the density of roads and motor trails. Management direction for MS 5 is that grizzlies are to be given deference up to a point but are subject to "control" in cases of conflicts with humans. Maintenance of habitat for grizzlies is an "option" but "is not directed"

Helena Forest Plan

The Helena Forest Plan (HFP) (1986) addresses grizzly bear management via the following Forest-wide standards and guidelines:

- HFP Appendix D—Guidelines for Management of Grizzly Bear Habitat: These guidelines provide direction based on the 1982 version of the Grizzly Bear Recovery Plan. "Grizzly bear habitat" (as of 1986) is identified and population/habitat conditions and management direction are specified for 2 "management situations" that occur in areas occupied by grizzlies. All grizzly bear habitat identified in the Forest Plan is on the Lincoln Ranger District: management situation 1 lands are inside the NCDE Recovery Area; management situation 2 lands are south of the NCDE boundary.
- HFP Appendix E—Grizzly Bear Management Outside of Recovery Areas: These guidelines specify steps to be taken in identifying and inventorying potential grizzly habitat, documenting grizzly "biological activity centers" (BACs), protecting areas used by grizzlies, and determining if management direction for the areas should be changed to emphasize grizzly bear needs. The guidelines apply to the Divide, Big Belts, and Elkhorns landscapes on the Helena and Townsend Ranger Districts, as well as the Lincoln District south of Highway 200.
- Indicator Species (HFP, p. II/17): The grizzly bear is to be monitored as a management indicator for the threatened and endangered species group—the objective being to determine whether or not viable populations are being maintained.
- Biological Evaluations (HFP, p. II/19): A biological evaluation must be written for all projects that have potential to impact grizzly bears, and appropriate mitigations developed (in consultation with the USFWS, if necessary) if adverse impacts are likely.
- Field Studies (HFP, p. II/19): Field studies should be conducted in areas not yet designated as occupied grizzly habitat but where grizzlies are known to be present. The areas should be managed according to guidelines in Appendix E.

- Open Road Density (HFP, p. II/19): In occupied grizzly habitat, so as to minimize human-caused mortality, open road density should not exceed 0.55 mi/mi².

Grizzly Bear Habitat and Population Status in the Project Area

The Divide Landscape

Core Areas and Road Densities

Effective grizzly bear range requires a reasonable distribution of “core areas” that can provide the bears with basic habitat components (food and cover) in an environment free from motorized disturbance and other forms of “high-intensity” human use (as along popular hiking trails) during the period when bears are active (April–November) (IGBC Motorized Access Management guidelines 1998). The Helena NF delineates grizzly bear core areas as blocks of suitable habitat larger than 2,500 acres with all boundaries 0.3 miles from motorized routes open during the non-denning period (see IGBC 1998; USDA 2005, p. 7, 32; USDI FWS 2006, p. 22). While these parameters were originally designed to be applied to occupied grizzly bear habitat in and around Recovery Zones (Management Situations 1 and 2), they are applied here to the Distribution Zone as a way of comparing infrastructure for motorized use.

The Divide landscape currently supports 8 “core” areas with potential to provide grizzly bears with refuge from human interference [Table 129]. These non-motorized areas represent 30 percent of the landscape [all lands, public and private, within Helena NF administrative boundaries] south of Highway 12 but only 11 percent north of the highway (23 percent overall). This compares to core area percentages of 67 percent – 75 percent in Bear Management Subunits within the NCDE Recovery Zone on the Lincoln District (USDI FWS 2006, p. 21-22).

The effectiveness of these unroaded areas as grizzly bear habitat—in terms of their size, abundance and distribution of key habitat components, and their proximity to other such core areas—is variable. The Electric Peak Roadless Area, for example, provides productive foraging habitat and excellent cover in an extensive unroaded environment—and it is adjacent to similar habitat on the Beaverhead/Deerlodge NF to the south. The Sweeney Creek–Austin Creek Area, on the other hand, is only slightly larger than the minimum 2,500 acres, surrounded on 3 sides by high-use roads and human settlement, and provides productive habitat primarily in an array of highly fragmented drainage-head sites. Grizzly bears have been reported in both areas, but observations have been considerably more consistent in the upper Little Blackfoot. It should be noted that grizzly bears have also been reported, both north and south of Highway 12, in a number of non-motorized habitat blocks in the 1,000-2,500 acre range. The Divide landscape, while not a region with enough secure habitat to provide for a core grizzly bear population, does provide habitat enclaves for bears moving through and, apparently, for a small resident population.

Table 129. Potential grizzly bear core areas within the Expanded Distribution Zone

	Potential “Core” Areas	acres
South of Highway 12	Lazyman Gulch Roadless Area	10,260
	Jericho Mountain Roadless Area	6,993
	Treasure Mountain	2,970
	Electric Peak Roadless Area	22,383
	Baldy Ridge	2,538
North of Highway 12	Black Mountain (north)	3,780
	Meyers Hill – Deadman Creek	2,808
	Sweeney Creek – Austin Creek	2,673
Total	Expanded Grizzly Bear Distribution Zone	54,405

In addition to the presence of core areas, the overall density and distribution of roads and motor trails in a given area is a key to determining habitat suitability for grizzly bears. Mace and Manley (1993) found that in Montana adult bears use habitat with open road densities that exceed 1.0 mi/mi² less than expected (if habitat use were random). All sex and age classes used habitat with total road densities above 2.0 mi/mi² less than expected. Grizzlies generally adjust to disturbance along roads by avoiding the areas around regularly-traveled routes. This lowers the likelihood of grizzly-human conflict in areas where roads and multiple use management are more common, but it diminishes the amount of habitat available to the bears (Mace and Waller 1998).

The IGBC Motorized Access guidelines (IGBC 1998) thus recommend calculating the overall density of open roads and total roads (open + restricted) in addition to delineating core areas. Although “closed” or “restricted” roads exclude motor vehicles, they still provide travelways for hikers, equestrians, bicycle riders, and hunters afoot. If these uses occur at high levels, the ability of an area to hold grizzly bears may be compromised much as it would be by open roads and motor trails (Mace and Manly 1993). Route densities for the Divide landscape are shown in Table 130. These densities are calculated for the Divide Travel Plan Area, which excludes the upper Little Prickly Pear drainage north of the highway and the Clancy-Unionville area south of the highway. The open road densities, however, are typical of the Divide landscape portion of the Grizzly Bear Distribution Zone as a whole.

Table 130. Densities of all open roads on public and private lands within HLCNF Forest Administrative boundaries north and south of U.S Highway 12. Figures are derived from the Divide Travel Plan analysis—which excludes the upper Little Prickly Pear Creek and Clancy-Unionville areas.

Divide Landscape (as estimated by the Divide Travel Plan Area)	All Lands within HLCNF Administrative Boundaries		
	Area (mi ²)	Open Road miles	Open Road Density (mi/mi ²)
North of Highway 12	127	264	2.1
South of Highway 12	238	299	1.3
Total	365	563	1.5

Table 130 shows that open road densities in the Divide landscape are substantially higher north of U.S. Highway 12 than they are south of the highway. The overall open road density of 1.36 mi/mi² (as extracted from the Divide Travel Plan analysis) is 3 to 10 times higher than densities in Bear Management Subunits of the NCDE Recovery Zone on the Lincoln Ranger District. Those units, which are managed specifically to enhance grizzly bear recovery, show densities in the range of 0.14 to 0.47 mi/mi² [a maximum of 0.55 mi/mi² is the Forest Plan standard for Recovery Zone Management Situations]. The fact that grizzlies continue to move through and occupy parts of the Divide landscape in spite of road densities that approach or exceed levels recommended by Mace and Manley (1993) may reflect the rough, primitive condition of many Forest and private roads and the low levels of vehicle use they receive in summer—to the point that bears may often not perceive them as functioning roads. The presence of a few unroaded enclaves—the size of core areas in the Recovery Zone—also ameliorates the impact of dense road networks in other areas.

Grizzly Bear Occurrence in the Landscape

Grizzly bears have been observed throughout the Divide landscape numerous times over the past 25 years [Helena NF wildlife observation data base; MFWP records (Helena Area Resource Office)]. A majority of observations have come from the northern half of the landscape toward the NCDE Recovery Zone and have probably been of bears that den and center much of their activity in the Blackfoot landscape of the Lincoln Ranger District but that range southward during part of the year.

South of U.S. Highway 12, most observations have come from the upper reaches of the Little Blackfoot watershed and along the border between the Helena NF and the Beaverhead-Deerlodge NF (including the upper Cataract and Basin Creek drainages just to the south). The number of credible grizzly bear reports in these areas has been increasing in recent years as the population in the NCDE expands to the point that more bears are exploring new territory further to the south (J. Jonkel, personal communication, 2007). Be that as it may, recent monitoring efforts designed to identify individual grizzlies through DNA analysis of hair samples collected from rub trees (2009-2010) have yet to turn up any sign of the bears south of Highway 12—a further indication of their scarcity in this area.

The tally in Table 131 is incomplete, but it includes most credible observations made by or reported to Helena NF and Helena-area MFWP biologists from 1991 to 2012. Most of

the reports are from the Helena NF, but 7 observations are from south of the Forest boundary on the Beaverhead-Deerlodge NF: One of these consists of a series of close-up photos from a camera station on the Continental Divide south of Electric Peak in 2012; another is a MFWP report of a grizzly shot in the Boulder River Drainage further to the south [both, obviously, verified occurrences]. Reports that were vague or otherwise dubious (of which there are many) were eliminated, and those deemed credible by professional wildlife specialists or that seemed reliable for other reasons were retained. The actual number of grizzlies that have ranged into the Divide landscape since 1991 is considerably less than these totals might suggest since some of the bears have been observed and tallied multiple times over 20 years.

Table 131. Credible observations of grizzly bears in the Divide landscape reported 1991-2012

Area	Observations from HLCNF Records	Additional Observations from MFWP Records	Total Observations 1991-2011
North of U.S. Highway 12	22	22	44
South of U.S. Highway 12	12	23	35
Divide Landscape Total	34	45	89

North Divide

The northern half of the Divide landscape is an area still very much in transition with regard to its role in grizzly bear recovery. Although it lies adjacent to the Blackfoot landscape where a resident grizzly population has been established for several decades, only its northernmost reaches—the Little Prickly Pear watershed—may accommodate resident bears (animals that either den in the upper drainages or spend a substantial portion of their active spring-summer-fall season there). Bear activity in the rest of the landscape appears fluid, associated with long-distance dispersal or with wide-ranging seasonal forays beyond core home ranges to the north. The number of bears likely to be present in the northern Divide landscape at any given time is unknown. But, two decades of fortuitous observations and occasional targeted field checks suggest the following:

- In spite of the fact that the grizzly bears have been reported in this area north of Highway 12 Pass for over 2 decades, there is currently no bonafide “resident” population in the area south of the Little Prickly Pear watershed (at the northern end of the Divide landscape).
- Bears observed south of the Little Prickly Pear watershed appear to be either transient animals moving southward through a linkage zone or those with ranges centered further north (on the Lincoln Ranger District or the Little Prickly Pear watershed) that sometimes foray southward.
- Neither denning nor reproduction has been documented in the Divide landscape between the Dog Creek/Little Prickly Pear divide in the north and the upper reaches of the Little Blackfoot watershed to the south.

The north Divide landscape is therefore not currently part of a Biological Activity Center for grizzlies [which requires that female bears with cubs be observed 5 out of 10 years (HFP, Appendix E)].

South Divide

Grizzly bears that occupy or move through the Expanded Distribution Zone in the southern half of the Divide landscape where the Tenmile – South Helena Project is located also range into the drainages flowing southward into Boulder River on the Beaverhead-Deerlodge NF. Although rural residences, open roads, motorized trails, developed recreational facilities (campgrounds, etc.), livestock grazing, mining operations, and other human activities are spread throughout this block of territory, substantial portions of it are unroaded or lightly roaded. While the area is not sufficiently untrammelled to serve as a Recovery Zone, the fact that grizzlies seem to have persisted here for at least two decades (albeit in very low numbers) suggests that it has a role to play in the recovery process—potentially providing local habituation opportunities and linkage between bonafide Recovery Zones.

- As with the area north of Highway 12, the southern half of the Divide landscape is still very much in transition with regard to its role in grizzly bear recovery. At this time, the size of the local grizzly population is unknown and its status uncertain. All that can be said, based on field observations to this point, is the following:
- Population density is very low (only 5 verified occurrences in the general area 2004-2012—although several additional observations are highly credible).
- Reproduction is uncommon (4 reports of a sow with cubs since 1991).
- The stability and persistence of the current population may be tenuous (since the presence of grizzlies may be indicative of a linkage zone with transient individuals rather than an incipient Biological Activity Center) (HFP, Appendix E).

The Tenmile – South Helena Project Area

The Tenmile – South Helena project area encompasses only one potential grizzly bear core area in its entirety—the Lazyman Gulch Roadless Area (10,260 acres); but it also takes in most of the Jericho Mountain Roadless Area (6,993 acres). In addition to these larger non-motorized areas, the project area includes a number of productive riparian and wetland habitats—often around the heads of drainages—that provide excellent cover and forage within unroaded blocks ranging from a few hundred to more than 2,000 acres. Many of the roads that approach these sites are little used most of the year and allow bears to range through the area with little chance of directly encountering a human.

As discussed earlier, the Tenmile – South Helena project area is situated near the center of a potential linkage zone that covers much of the National Forest on both sides of the Continental Divide. While the Divide represents the central feature of this zone, grizzly bears moving through the area are not confined to a narrow corridor astride the Divide Ridge. While there is a considerable amount of good habitat near the Divide—provided by the headwaters of numerous local streams that originate just below the ridge—the bears would be able to find numerous suitable routes through this part of the landscape, including some through the project area. Movement through the area will be complicated in the next few years by the downfall of forest overstory in the ubiquitous beetle-killed lodgepole pine forests. This will cause bears to alter current travel routes and it will also

provide them with a different kind of cover than that currently provided by standing tree trunks.

Environmental Consequences

The following measures are used to evaluate effects to grizzly bears:

- Effects to forested cover – i.e. acres treated in the project area
- Acres of potential forage created in the project area
- Human activities that could lead to disturbance, displacement, or direct mortality

Desirable Habitat Conditions

- ✓ Ample foraging opportunities
- ✓ Well-connected and effective travel corridors
- ✓ Minimal human interaction

Effects Common to All Alternatives

Untreated portions of the project area will continue to progress through succession regardless of alternative. Disturbance processes including climate change, insect infestations, disease, and fire will continue to influence the project area. At any given time, the project area will comprise a variety of successional stages. Dead and dying trees associated with the mountain pine beetle outbreak would continue to fall to the ground. However, because of the productivity of the project area in general, the MPB impacts would not likely result in long term ‘deforestation’ unless a severe wildfire were to occur after new forests have regenerated.

Effects Common to All Action Alternatives

Timber harvest and prescribed fire in the action alternatives would remove conifers from stands that are currently providing forested cover. This would potentially increase forage but would reduce tree density that currently provides cover. Post-disturbance conditions following harvest differ from those following most natural disturbances in terms of the types, levels, and patterns of structural legacies (Franklin et al 2002). Remnant trees have important influences on stand development (Ibid). While traditional clearcutting left few to no remnant trees, all proposed treatments with the Tenmile – South Helena project would leave some remnants where living trees are available. Treatments would generally promote seral species composition (lodgepole pine) over shade tolerant competitors (spruce and fir), and promote more open structures.

The action alternatives would create patches and patterns that to some extent emulate natural fire which has been excluded from this ecosystem for a century. The restoration of fire adapted ecosystems does not involve simply the maintenance of open, late seral stands, but also promoting a mosaic of conditions on the landscape on all forest types. Proposed treatments would promote resilience to disturbances by creating a mosaic of conditions in densities, species composition, and age class that differ from untreated areas that would help ensure that not all forests are equally susceptible to the same disturbances at the same time.

While grizzly bears make extensive use of forest cover, they generally prefer to operate in a landscape with a variety of habitat formations ranging from dense interior forest to open meadowlands (Dood et al. 2006, p. 18).

Alternative 1

Direct/Indirect Effects

There are no treatments proposed under this alternative, so there would be no direct effects to bears or their habitat in the project area. Risk of wildfire would remain high; therefore the likelihood of long-term loss of grizzly bear habitat from stand replacing wildfire is greatest under this alternative. Also, due to continued fire suppression and insects and disease, whitebark pine is anticipated to continue to decline under this alternative. Fallen trees, the result of the mountain pine beetle outbreak, could present local barriers to movement.

No Action Alternative Cumulative Effects

While there can be no cumulative effect from no action being taken, a discussion of the likely trajectory of grizzly bear habitat may prove beneficial. Alternative 1 maintains the status quo with regards to landscape level effects on grizzly bears. Untreated stands that have been affected by the mountain pine beetle would continue to unravel resulting in mixed habitat opportunities for grizzly bears.

Alternatives 2 and 3

Direct/Indirect Effects

Most of the habitat management guidelines in the MFWP Grizzly Bear Management Plan for Western Montana (Dood et al. 2006, p. 48-49), as well as those in previous management guidance dating back to the Grizzly Bear Recovery Plan (1982), are focused on roads (as agents of fragmentation and as conduits for bringing humans into bear habitat). A few guidelines, however, deal with habitat manipulation and human presence in general (including livestock grazing) and apply to the Tenmile – South Helena project. Table 132 shows the differences in alternatives for grizzly bear habitat components of cover and forage. When trees are removed from a site, tree cover and shade are reduced while ground cover plants may become more abundant. In much of the project area, this effect would last up to about 30 years (depending upon the site) until trees become dense enough to shade out the early successional understory plants. On drier sites containing ponderosa pine trees, however, more open understory conditions would be maintained over the long term (see the Forest Vegetation Report).

Some, but not all forested sites have the potential to produce vegetation that provides food for bears following logging. Many harvest units overlap habitat types that have the potential to increase production of bear foods such as huckleberries and serviceberries (Pfister et al. 1977). [See Assumptions, Information Used, and Methodologies section.]

Table 132. Changes in grizzly bear cover and forage habitat by treatment type and alternative

Treatment Type	Habitat Effects	Alternative 2	Alternative 3
Regeneration Harvest	Reduction in cover	4,001	2,450
	Potential increase in forage	789	631
Intermediate Harvest	Reduction in cover	5,577	4,929
	Potential increase in forage	1,105	977
Precommercial Thinning	Reduction in cover	471	445
	Potential increase in forage	24	18
Prescribed Fire	Reduction in cover	13,241	7,608
	Potential increase in forage	2,154	687

All harvest would result in a reduction in cover, with regeneration harvest resulting in a long-term loss of overhead forested cover and alternative 2 resulting in the greatest reduction of both action alternatives. As a result bear use of regenerated sites could be reduced and most use within the next 10 years would be expected to occur largely near edges of treatment areas or riparian buffers (i.e. areas that provide cover). Cover will also be reduced on partial or intermediate harvest units, although residual overstory cover will be maintained on sites treated. Also riparian buffers would be maintained and interspersed throughout many units, further limiting sight distances. It is expected that, overall, intermediate harvest prescriptions would provide adequate cover to provide for bear security. The amount of human activity and access also determines the likelihood a harvest site would be used by bears. There will be no change in public access within the project area; however 43 and 24 miles of temporary road would be built in alternatives 2 and 3 respectively. Most of the timber harvest occurs adjacent to or in the vicinity of an existing road where bear use is already expected to be low.

While timber harvest would result in a long-term reduction in forested cover, available forage would increase in the openings associated with harvest. For example Nielson et al (2004) found that the occurrence of critical grizzly bear foods, including roots and tubers, herbaceous vegetation and ants were more common in clearcuts than the surrounding forest. Also shrubs including huckleberry and buffalo berry were found to increase, although this varied by site (Martin 1983, Zager et al 1983). Alternative 2 would result in the increase in forage on up to approximately 1,918 acres associated with timber harvest; alternative 3 up to 1,626 acres (See Table 132).

Bear use of harvest units varies over time. Some research indicates that grizzly don't utilize harvest units until 10 years after treatment (MDNRC 2010), whereas other research found that grizzlies utilized recent clearcuts (Nielson et al 2004, Wielgus and Vernier 2003). Other studies indicate that intermediate aged clearcuts (approximately 30 years of age) were selected throughout the year, whereas recent and old clearcuts were utilized largely early in the year and again between early August and denning (Nielson et al 2004). While grasses and forbs would be expected to increase on all sites, increases in shrubs (e.g. huckleberries) were found to be greatest on moist sites with northern and easterly aspects (Martin 1980). Consequently cover and forage availability as well as bear use will vary over time and by site.

Prescribed fire is proposed on 15,028 acres in alternative 2 and 11,552 acres in alternative 3. The mixed severity prescription should create openings that favor forage development. Prescribed fire would result in a flush of herbaceous vegetation and shrubs on up to 2,154 acres in alternative 2 and 687 acres in alternative 3 (Martin 1980).

All timber harvest would be implemented via ground-based logging systems. Helicopter logging is not included in either action alternative. As mentioned, 43 miles of temporary road would be constructed in alternative 2 and 24 in alternative 3. An additional 38 miles of roads that are currently closed yearlong to the public would be used for logging activities in alternative 2; 32 miles in alternative 3. Motorized use on roads closed yearlong or on temporary roads during project activities could result in short-term disturbance and displacement of grizzly bears. Once harvest related activities have been completed, the temporary roads would be obliterated and the closed roads used for the logging activities would return to the existing status – closed.

Action Alternatives Cumulative Effects

Cumulative effects are the incremental impacts that the direct and indirect effects associated with the action alternatives have on grizzly bear habitat in the context of the myriad of other past, present, and future effects on grizzly bear habitat from unrelated activities. The cumulative effects analysis considers spatial and temporal boundaries, how past activities have contributed to the existing condition, and whether the ecosystem can accommodate additional effects. Table 133 summarizes the key items that are taken into consideration for the cumulative effects analysis for grizzly bear habitat. See also Appendix E to the Wildlife Report for more information.

Table 133. Cumulative effects considerations for grizzly bear habitat

Parameter	Discussion
Spatial Boundary	The spatial boundary needs to be expanded to the point at which riparian habitats are no longer measurably affected. The Divide Landscape - South satisfies this requirement because this is the scale at which the effects to grizzly bears can be examined at the stand or treatment unit. The boundary also provides a sufficient landscape to assess pattern and structure in the context of larger processes.
Temporal Boundary	The temporal boundary ranges from the 1960s (due to a lack of earlier records in the FACTS database) to those future projects that are either listed in our SOPA or are planned or implemented on private land within the project boundary.
Past Activities and Existing Condition	The effects of past activities are reflected in the existing condition. Past activities shaped the vegetative and species composition of grizzly bear habitat that comprise the project area today. The existing condition, which incorporates the changes due to past activities, has been measured by remote sensing and field validation.
Activities Considered in Cumulative Effects	Past activities that are included in the cumulative effects analysis include timber harvest, fuels activities, livestock grazing, mining, road construction, the Forest-wide Roadside Hazard Tree Removal and Fuels Reduction Project and private land timber harvest.
	Ongoing and future activities include the Red Mountain Flume/Chessman Reservoir project, Telegraph project, Tenmile Forest Road, livestock grazing, routine use and maintenance of Forest trails and roads, and Divide Travel Planning.
Measurement Indicators	Measurements are qualitative
Thresholds	No threshold is applicable to this indicator
Methods	Past, ongoing, and reasonably foreseeable activities are described qualitatively based on information derived from the FACTS database.
Assumptions	The assumptions for describing past and foreseeable treatments are made based on terminology described in FACTS since these definitions are standardized.

Past Activities

Past forest management actions such as timber harvest/salvage, precommercial thinning, and prescribed burning have generally been favorable for grizzly bears because these activities created a mosaic of forest age classes and increased vegetation diversity, and bear forage opportunities. However, roads built for these activities and left open for use have reduced grizzly habitat quality. Table 134 summarizes past harvest activities in the Divide Landscape – South.

Table 134. Past Forest Service timber harvest activities and their impacts on the grizzly bear habitat in the Divide Landscape - South

Decade	Harvest Type	Acres	Effect
Forest Service Timber Harvest Pre-1960s through 1970s	Regeneration Harvest	4,080	These past harvest treatments have resulted in landscape patterns today that favor grizzly bear habitat – i.e. a mosaic of forested age classes.
	Intermediate Harvest	264	
Forest Service Timber Harvest 1980s through 1990s	Regeneration Harvest	3,220	
	Intermediate Harvest	465	
Forest Service Timber Harvest 2000 to Present	Regeneration Harvest	1,089	
	Intermediate Harvest	1,977	

Ongoing Activities

Ongoing activities that have improved prospects for grizzly bears include trail relocation projects that have removed trails from riparian areas to upslope locations (Blackfoot Meadows, CDNST); mine reclamation projects, some of which have improved riparian habitat function favorable to bears; establishment of the Statewide OHV Plan (2001) which prohibits riding off established motorized routes; grazing allotment revisions that have often reduced cattle numbers and improved habitat; and road and motorized trail closures associated with timber sales (Clancy-Unionville, Sound Wood, Treasure Mountain) that have enlarged non-motorized blocks of habitat.

Ongoing activities that may have reduced the quality of grizzly bear habitat in the Divide Landscape – South include road permits across the Helena NF to access private holdings; retention of private recreational residences on the Helena NF (especially near the Divide at MacDonald Pass); small mining operations; construction and maintenance of communication sites and power lines; and widespread fencing associated with grazing allotments that complicate movement. The ongoing Red Mountain Flume/Chessman Reservoir Project is removing dead lodgepole pine from 490 acres in the upper Tenmile drainage. The resulting habitat opportunity for grizzly bears would be mixed. Private land development continues to create sites that generate problems for animals striving to move through or occupy the landscape (barriers to movement, habitat loss, bear attractants, dogs). Recent purchase of 27,600 acres of private ranchland in the Spotted Dog drainage by MFWP will forestall subdivision and development of those lands immediately west of the Helena NF boundary and allow them to remain in a condition more amenable to grizzly bear habitation and passage. The improvement of the Rimini Road could also affect grizzly bears.

Reasonably Foreseeable Activities

Reasonably foreseeable activities that may affect grizzly bears include the Telegraph Project which would alter dead tree environments over a wide area from the Continental Divide eastward to the outskirts of Helena. Private land timber harvest could also affect grizzly bears and their habitat. The effects on grizzly bear habitat would be mixed –

some beneficial, some problematic. The Divide Travel Plan should prove beneficial for grizzly bears compared to the existing condition. Several miles of roads will be closed in the Divide Landscape creating non-motorized blocks that could provide secure habitat for grizzly bears.

The Forest Plan amendment to incorporate relevant direction from the NCDE grizzly bear draft conservation strategy is designed to integrate relevant habitat-related direction from the Northern Continental Divide Ecosystem (NCDE) Grizzly Bear Conservation Strategy (GBCS) into the forest plans for the Helena, Kootenai, Lewis and Clark and Lolo National Forests (also referred to as “amendment forests”) to have an integrated set of plan direction (referred to as plan components from this point forward) consistent across the national forests that are a part of the NCDE.

Cumulative Effects Conclusions for the Action Alternatives

Implementation of alternative 2 or 3 would contribute to the effects associated with past timber and fuels activities that are partially responsible for the existing condition. Specifically, the project area would become more open in the short term while stands regenerate and develop understories. Cover would be removed in both alternatives 2 and 3 adding to those impacts associated with past timber harvest and fuels activities. Implementation of either alternative 2 or 3 would contribute to the effects associated with the ongoing Red Mountain Flume/Chessman Reservoir project, private land timber harvest, and grazing, and the proposed Telegraph project. As stands are thinned, conditions will favor production of herbaceous and shrub habitats that are attractive to grizzly bears. Alternatives 2 and 3 would also add to the impacts associated with annual road maintenance due to temporary road construction associated with those alternatives. Cumulatively, these activities may temporarily disrupt animal movement. Travel plan implementation, however, should offset impacts associated with alternatives 2 and 3 because it will result in the creation of large unroaded areas that should provide some additional secure habitat for grizzly bears.

Irreversible and Irretrievable Commitment of Resources

There are no irreversible or irretrievable commitments of resources.

Conclusions

Vegetation management can negatively affect grizzly bears by (1) removing cover; (2) disturbing or displacing bears from habitat during the logging period; (3) increasing human/grizzly bear conflicts or mortalities as a result of unsecured attractants; and (4) increasing mortality risk or displacement due to new roads into previously roadless areas and/or increased vehicular use on existing restricted roads. Conversely, vegetation management may result in positive effects on grizzly bear habitat once the project is complete, provided key habitats such as riparian areas and known food production areas are maintained or enhanced. For instance, tree removal for thinning or timber harvest and prescribed burning can result in localized increases in bear foods through increased growth of grasses, forbs, and berry-producing shrubs (Zager et al. 1983; Kerns et al. 2004).

Changes in the distribution, quantity, and quality of cover are not necessarily detrimental to grizzly bears. Grizzly bears will use a variety of habitats including open-canopied habitats such as areas where timber has been harvested (Waller and Mace 1997 and Mace et al. 1997).

Both action alternatives would improve landscape level foraging habitat, enhance whitebark pine, result in short term reductions in cover, and potentially increase the risk of bear/human interaction during project implementation. However, implementation of either alternative 2 or 3 may affect but is not likely to adversely affect grizzly bears for the following reasons:

- A majority of the project area would remain untreated in either action alternative (60 percent in alternative 2 and 70 percent in alternative 3);
- Temporary roads would be closed to the public;
- Proposed treatments would promote the long-term sustainability of whitebark pine, increase stand and landscape level forage, and restore fire to the landscape while reducing the risk of stand replacing wildfire and a further reduction in grizzly bear habitat; and
- Proper food storage would be required for contractors and Forest administrators during project activities.

Forest Plan Consistency

Forest Plan standards for grizzly bears that are applicable to this project are:

- A biological evaluation will be written for all projects that have potential to impact any T&E species or its habitat. All evaluations will address each projects potential to adversely modify a listed species habitat or behavior. If an adverse impact is determined, mitigation measures will be developed to avoid any adverse modification of a listed species habitat or behavior. If all possible mitigation measures do not result in a no affect determination, then informal and/or formal consultation with the U.S. Fish and Wildlife Service will be initiated. The analysis of TES species in the Wildlife Specialist's Report serves as the Biological Evaluation for this project. A separate Biological Assessment of T&E species will be prepared and submitted to the USFWS for consultation.
- Initiate field studies in undesignated areas known to be used by grizzlies, to determine if the areas should be designated as grizzly habitat. Until sufficient evidence is available to determine the status of these areas, manage them according to Appendix E, Grizzly Management Guidelines Outside of Recovery Areas. At this time, the size of the local grizzly population is unknown and its status uncertain. All that can be said, based on field observations to this point, is the following:
 - Population density is very low (only 5 verified occurrences in the general area 2004-2012—although several additional observations are highly credible).
 - Reproduction is uncommon (4 reports of a sow with cubs since 1991).
 - The stability and persistence of the current population may be tenuous (since the presence of grizzlies may be indicative of a linkage zone with transient

individuals rather than an incipient Biological Activity Center) (HFP, Appendix E).

Recommendations for Removing, Avoiding, or Compensating for Adverse Effects

USFWS Terms and Conditions

In its Biological Opinion on the Effects of the Helena National Forest Plan on Grizzly Bears (USDI FWS 2014), the USFWS has concluded that continued implementation of the Helena Forest Plan in the Expanded Distribution Zone is not likely to jeopardize the continued existence of the grizzly bear. The Helena NF is thus able to go forward with actions such as the Tennmile – South Helena Project as long as they comply with the “incidental take statement” in the Biological Opinion. Included in the statement are a number of non-discretionary “terms and conditions” with which the Forest must comply in order to “[r]educe the potential for mortality and displacement of grizzly bears on the Forest, both inside and outside the NCDE” (USDI FWS 2014, p. 62-63).

The first two terms may be applicable to vegetation projects such as the Tennmile – South Helena Vegetation project: (1) the Helena NF will consult with the USFWS if a net increase in permanent roads in the Divide landscape exceeds 5 linear miles over the next 10 years (with decommissioning of roads being taken into account) and (2) consultation will also be required for a net increase of more than 30 miles of temporary roads in the landscape over the next 10 years. The remaining 3 terms deal with management of grazing allotments and do not apply to vegetation projects.

The Tennmile – South Helena Project would not add any permanent roads to the landscape but it would add up to 43 miles of temporary road (closed to the public) for the duration of the project (alternative 2). In combination with the proposed 8.5 of temporary road in the Telegraph Project, this exceeds the 30 mile threshold for the coming 10 year period and additional consultation will be required as a result.

USFWS Conservation Recommendations

In addition to these “terms and conditions” the USFWS has also included four “conservation recommendations” in its Biological Opinion. These involve (1) identifying and managing linkage habitat between ecosystems, (2) lowering road densities, (3) expanding food storage orders across the Forest (for back-country provisions, garbage, livestock feed, etc.), and (4) minimizing human activity in areas where grizzly bears concentrate seasonally.

As mentioned above, the project would not add to net density of permanent roads. The project would not have any effect on sites where grizzly bears are known to concentrate. The effect of the project on linkage for grizzly bears through the Tennmile – South Helena project area has been discussed earlier in this report and is not considered to be significant. A food storage order would be applied to all human activity associated with implementation of the project.

Wolverine

Affected Environment

Wolverine Biology

Population Parameters and Habitat Relationships

The wolverine (*Gulo gulo*) is the largest terrestrial member of the weasel (mustelid) family in North America. Wolverines are generally solitary animals that range widely through a variety of habitats. While generally moving within established home ranges, they exhibit flexible behavior when environmental conditions (such as food supply) change, leading to movement beyond normal boundaries (Hatler 1989). For the most part, wolverine habitat is best defined in terms of adequate year-round food supplies in large sparsely inhabited areas, rather than in terms of particular Copeland and Hudak topography or plant associations (Kelsall 1981, cited in Banci 1994). The exception is the affinity that female wolverines exhibit for higher elevation alpine sites with deep snow accumulation: such habitats are critical for establishment of natal and maternal dens in late winter and spring.

Preferred ranges are large, isolated tracts of land supporting a diverse prey base (Hornocker and Hash 1981). Wolverines will range into roaded areas with a modicum of human activity, but this use often occurs in winter when many of these areas become “remote” because of winter conditions. In summer, wolverines typically move to back-country areas at higher elevation. These behaviors effectively separate wolverines and humans other than for rare encounters. Human encroachment into existing refuges may threaten the wolverine’s ability to maintain basic life history requirements (1995). Human activity (road building, developed campgrounds) near subalpine boulder talus sites may eliminate historic foraging or denning habitat. It has been hypothesized that persistence of wolverines in Montana, despite unlimited historic trapping and hunting, may be attributed to the presence of designated wilderness and remote, inaccessible habitat (Hornocker and Hash 1981).

Wolverines occur in low densities in all places they have been studied. This has been attributed to naturally low reproductive rates and delayed sexual maturity as well as the unreliability of adequate food supplies throughout the year (Banci 1994). Maintenance of large territories and susceptibility to trapping also play a role (Hatler 1989). Overall, food availability seems to be the primary factor determining movement and specific habitat use and is probably the primary limiting factor for wolverine populations (Hornocker and Hash 1981; Hatler 1989).

Although the wolverine is primarily a scavenger, it forages for most of its own food during the summer. Common foods include ground squirrels and marmots in open habitats, snowshoe hares and porcupines in forested areas, and mice, insects, berries, eggs, and ground nesting birds wherever they are found (Foresman 2012 p. 301-302). In winter, wolverines rely on carrion, and therefore are largely dependent upon the presence of other predators—although they are also able to take advantage of animals dying from disease, starvation, and accidents (falls, avalanches). They establish food caches in winter, and are adept at locating and raiding caches made by other wolverines and other

carnivores such as mountain lions and foxes (Banci 1994). In fall they take advantage of gut piles and carcasses produced by hunters.

Beginning in late winter, reproducing females establish a series of dens: natal dens (birthing), maternal dens (post-birth, pre-weaning), and post weaning dens (rendezvous sites) (Copeland 1996). Natal dens are established at high elevations, typically in talus or cirque basins while maternal dens occur both in talus and among fallen trees (Copeland 1996). These dens, in order to be effective, require deep snow that persists into the spring. Rendezvous sites may occur in talus or coniferous riparian zones. Protection of natal/maternal denning habitat is critical for wolverine persistence.

Data collected in northwestern Montana indicate that average yearly ranges are 262 mi² for males and 241 mi² for females (Hornocker and Hash 1981). Although wolverines maintain large home ranges and can utilize almost any habitat, they are sensitive to human disturbance and are especially susceptible to trapping because of their opportunistic eating habits. Trapping accounts for a high proportion of wolverine mortality, affecting even populations that are locally protected (Squires et al. 2007; Inman et al. 2007; Banci 1994; Hatler 1989).

Key components of wolverine ecology revealed by research over the past three decades can be summarized as follows: (1) wolverines need adequate space to maintain populations; (2) population fragmentation must be avoided to maintain genetic, social, and spatial continuity of subpopulations; (3) the environment must be capable of providing a varied seasonal diet; and (4) security areas must be available to provide undisturbed seclusion for reproducing females (Copeland and Hudak 1995).

Recent research suggests that an additional factor of key importance to wolverines is the need for sites, somewhere within the home range, that retain deep snow well into the spring. McKelvey and others (2011) have argued that while wolverines can be considered habitat generalists in many respects, the fact that females are highly dependent on deep snow for establishing and maintaining viable reproductive dens ties wolverine populations to areas with persistent spring snow. At present, this includes many of the major mountain ranges in the northern and central Rockies, as well as the Cascade Range in Washington and Oregon. The implication of this dependence is that wolverine habitat in western North America is likely to become smaller and more fragmented as global warming diminishes the capacity of many sites to provide suitable spring snow cover (McKelvey et al. 2011).

Human Influences

Influence of Access Routes

Extensive unroaded or sparsely roaded habitat is often cited as a characteristic component of wolverine habitat (Claar et al. 1999; Banci 1994; Kelsall 1981, cited in Banci 1994), but it is unclear whether this is a cause-and-effect phenomenon or simply a function of the species' tendency, for a variety of reasons, to frequent higher elevation areas inhospitable to most human development. It is also possible that more wolverines are present in large wildland areas because of lower trapping mortality than occurs among those animals frequenting environments with ready road and trail access (Banci 1994).

Research throughout the Rocky Mountain region of Canada and the northern U.S. reveals no definitive conclusions as to whether wolverines are attracted to or avoid Forest roads and trails. Krebs et al. (2007) found that roads did not seem to influence habitat associations of male wolverines. Copeland et al. (2007) found no aversion or attraction of wolverines to maintained trails, although they noted that, wolverines frequently used snow-packed roads in their study area as winter travel routes. In reviewing other studies, they noted a general “spatial separation of wolverines and human-related infrastructure” but did not single out roads as a key factor.

The main impact of unpaved Forest roads and motor trails on wolverines comes from their role as snowmobile routes in winter for trappers and recreationists. They allow trappers to work trap lines in wolverine habitat that they would otherwise have difficulty reaching. Trapping has been cited as a primary source of wolverine mortality in a variety of studies (see Squires et al. 2007; Inman et al. 2007; Ruggiero et al. 2007; Banci 1994; Hatler 1989; Hash 1987). Roadways also provide snowmobilers with pathways up to high alpine basins where disturbance of natal denning habitat may be negatively impacting wolverine production in some areas (Claar et al. 1999; Banci 1994; Squires et al. 2007).

Influence of Timber Management

Although wolverines are frequently found in forested habitats, most researchers have concluded that they are not necessarily dependent on specific vegetation patterns of the sort that are typically manipulated by timber harvest, prescribed fire, or other forest management practices [see USFWS proposed listing of the wolverine: <http://federalregister.gov/a/2013-01478>]. While wolverines avoid active management operations in the forest (logging, burning, and associated activity), they often move through and make use of the new open environments once humans have abandoned the areas, particularly if prey is readily available.

Hornocker and Hash (1981) noted that wolverines in Montana cross new clearcuts, but usually at a brisk pace. On the other hand, they saw no differences in movements, habitat use, or behavior between wolverines occupying the half of their study area that had been logged and the half that was not. Copeland (1996) observed wolverines in Idaho traveling through and foraging in recently burned forest in spite of lost canopy cover. Krebs et al. (2007) found that male wolverines used recently logged areas in British Columbia but that females were less likely to do so. They theorized that this reticence was more an aversion to human activity and infrastructure than to vegetation patterns. Wolverines are more apt to use these areas once the new openings begin to fill in with seedlings and saplings.

Banci (1994) concluded that travel corridors between large unroaded refuges need not possess the optimal vegetation and other habitat attributes needed to support self-sustaining wolverine populations. She noted that females appeared more hesitant to move through large blocks of marginal habitat than males. Whereas extensive human settlement and highways may hinder or divert long-distance movement by wolverines, topographic features and vegetation patterns (including those generated by timber harvest) appear not to do so. Lyon and others (1994) indicate that while habitat change

produced by logging is obviously disruptive to movement patterns of marten and fisher, it appears to be much less so for lynx and wolverine.

Influence of Recreation

Low levels of dispersed recreation typical of trail systems, backcountry campsites, and low-grade Forest roads appear to have little influence on wolverines (Copeland et al. 2007, p. 2210). More concentrated forms of recreation such as developed campgrounds, ski areas, heavily used motor trails, and recreational cabins affect wolverines much as do most centers of human activity and infrastructure: wolverines avoid them for the most part, venturing in only when activity levels are low, typically at night, to investigate potential food sources. These forms of recreation tend to displace wolverines from habitat they might otherwise use or hinder their ability to take advantage of potentially available resources (Claar et al. 1999, p. 7.34-7.37). However, they seldom represent a direct mortality risk or a meaningful threat to wolverine population viability.

One class of recreation that may directly impact wolverine population processes involves high-country snowmobiling, skiing, and other backcountry winter activities in the vicinity of wolverine natal dens. Research as to the effects of such recreation on local wolverine productivity has been limited and, so far, inconclusive (Ruggiero et al. 2007; Krebs et al. 2007). However, given the limiting nature of natal denning habitat, the potential for any such impacts needs to be taken into account in management decisions. At this point, the primary threat to these natal and maternal denning habitats appears to be their slow demise due to climate change rather than from human interference (McKelvey et al. 2011).

Management Direction

Helena National Forest Approach

The wolverine receives no mention in the Helena Forest Plan (1986), but it has been listed as a “sensitive species” in USFS Region 1 since the late 1980s and thus has drawn special attention in environmental analyses. Because the wolverine is a habitat generalist in terms of the vegetation types it makes use of, less attention has been paid to crafting or protecting special forest configurations for its benefit. Rather, the focus has been on (1) preserving blocks of non-motorized habitat so as to provide refuge from human activity, (2) limiting winter trapper access into areas where wolverines might be present, and (3) restricting motorized winter recreation in areas that might support wolverine natal/maternal dens. In the Divide landscape, this has primarily involved closing roads, maintaining existing Roadless Areas, enlarging the size of areas with motorized restrictions, and expanding snowmobile closures.

While the HLCNF does not manage habitat specifically for wolverines in the Divide landscape, habitat management for other wildlife species serves to benefit wolverines. Ungulate carrion is a major food source, and management of elk and deer at levels sufficient to provide for hunting enhances the potential for this resource. Management for elk security also provides large blocks of non-motorized habitat that may provide havens for wolverines. Also, management aimed at improving connectivity of wildland habitat for a variety of species—by reducing roading and other forms of human

intrusion—aids the ability of wolverines to move throughout the Divide and improves prospects for survival.

Winter tracking surveys since 2007 have helped decipher the size and distribution of the local wolverine population as well as identifying specific areas and habitat patterns important to wolverines in this landscape. The information useful in this transition area between western and central Montana where several species (goshawks, lynx, flammulated owls, pileated woodpeckers) regularly exhibit adaptive habitat use patterns that diverge from what research has shown to be the norm in “westside” environments. As adaptive and opportunistic animals, wolverines probably fit this profile as well.

Proposed ESA Listing

The U.S. Fish and Wildlife Service proposed listing the distinct population segment of the wolverine in the contiguous United States as “threatened” in February 2013 [50 CFR Part 17, 78 FR 7864]. The proposed rule would prohibit “take” of the wolverine from trapping, hunting, shooting, or any other means—with the exception of incidental take associated with resource management activities. While the Fish and Wildlife Service felt that trapping remained a substantial problem for wolverine populations—and one that needed to be curtailed—the primary threat to the species was global climate change, which is eroding the sustainability of deep-snow spring denning habitat. Activities such as winter recreation and timber harvest were not identified as meaningful threats to wolverine populations [50 CFR Part 17; Federal Register, vol. 78, no. 23, p. 7877-7879].

After more than 18 months of evaluation, the Service has now (August 2014) withdrawn its proposal to list the wolverine. This decision was based on their conclusion that the factors affecting the contiguous U.S. population were not as significant as initially believed [50 CFR Part 17; Federal Register, vol. 79, no. 156, p. 47522-47545]. The wolverine thus reverts to its previous status as a Region 1 sensitive species.

Wolverines in the Divide Landscape and the Project Area

Habitat in the Divide Landscape

Wolverines are distributed in disjunct patches of montane habitat across the northern Rocky Mountains of the U.S. Population densities are highest in the main stem of the Rockies, tailing off in the island and peninsular ranges both east and west of the Continental Divide. Recent analysis of radio-telemetry data and subsequent habitat modeling (Inman et al. 2014) suggest that primary wolverine habitat in this region is concentrated in 3 large core areas: (1) the Northern Continental Divide ecosystem in northern Montana, (2) the Salmon–Selway region of northern and central Idaho, and (3) the Greater Yellowstone ecosystem of northwest Wyoming and southern Montana. In addition, a relatively small, isolated habitat block is located in the Bighorn Mountains of north-central Wyoming.

The Divide landscape lies within an area that Inman et al. (2013) refer to as the “Central Linkage Region”—a zone amidst the 3 large core areas that contains numerous small patches of primary habitat capable of supporting reproductive females. This region, while dominated by “dispersal habitat”, provides key connectivity that allows wolverine populations in the complex of core areas (along with the linkage region) to function as a

“metapopulation”. Habitat quality in the Central Dispersal Region need not be up to the standards required of the core population zones, but it does need to be sufficient to provide for regular wolverine movement throughout the metapopulation.

The Divide landscape, on average, provides drier habitat and less productive growing conditions than more optimal wolverine range in the core areas to the north, west, and south. In particular, the Divide supports less high alpine habitat, less old-growth forest, fewer moist forested habitats, less riparian and wetland, more grassland and shrubland, and more dry and open-grown forest than core area habitats. Recently burned-over forest is rare in this landscape, but beetle-killed stands now cover thousands of acres that 5-8 years ago were occupied by mature pine forest. A substantial segment of the landscape is thus in the early stages of transitioning from mature forest to early-seral forest. The implications of this change for wolverines are uncertain. However, given their adaptability and opportunistic use of a variety of habitat formations, they should be able to continue taking advantage of what the area has to offer, especially if prey abundance increases—as it often does in a shift to early seral environments.

Human activity and infrastructure (often tied to roads and trails) are widespread, but the impact across much of the landscape is intermittent and often modest. Within National Forest boundaries, few areas support enough consistent, concentrated human activity to repel wolverines, radically divert their travel routes, or block movement. Notable focal points of human presence include U.S. Highway 12, the towns of Rimini and Unionville, the Luttrell pit mine waste repository, MacDonald Pass recreation area, 4 Forest campgrounds, a few sections of much-used Forest/County road, and a number of residences and smaller enterprises, most on private inholdings. Except for Highway 12, which bisects the landscape into northern and southern segments, the distribution of infrastructure is highly fragmented. In addition to within-landscape activity centers, the City of Helena, the towns of Elliston, Clancy, and Marysville, and a number of rural subdivisions lie adjacent to or within a couple miles of the National Forest boundary.

Wolverines are drawn to large blocks of habitat in which human presence is minimal. Several potential wolverine safe havens exist in the Divide landscape and are tallied in 3 ways: non-motorized habitat patches larger than 1,500 acres (habitat connectivity assessment); non-motorized habitat blocks larger than 2,500 acres at least 0.3 mile from open roads (grizzly bear core area analysis); and areas larger than 250 acres and at least 0.5 mile from open roads (elk traditional security area analysis from Hillis et al. 1991). Such habitat blocks—summarized in Table 135—are important to male wolverines year-round and to adult females outside the natal denning season as areas in which they can forage, rest, breed, raise young, and travel with little human interference.

Table 135. Three measures of non-motorized sanctuaries available to wolverines in the Divide landscape under current road and motorized trail configurations.

Measures of Non-Motorized Habitat	Number of Habitat Blocks	Average Block Size (acres)	Total Acres	Percent of Landscape
<u>Connectivity Analysis</u> : Non-Motorized Habitat Blocks >1,500 acres with No Road Buffer *	21	5,396	113,325	64%

Measures of Non-Motorized Habitat	Number of Habitat Blocks	Average Block Size (acres)	Total Acres	Percent of Landscape
<u>Grizzly Bear Analysis</u> : Non-Motorized Habitat Blocks >2,500 acres more than 0.3 mi from Open Roads *	8	6,801	54,405	31%
<u>Elk Security Analysis</u> : Non-Motorized Habitat Blocks >250 acres more than 0.5 mi from Open Roads	20	3,818	76,370	33%
* Acres and percentages in connectivity and grizzly bear analyses are based on the approximately 177,713 acres, which is slightly smaller than the Divide landscape: thus they underestimate, somewhat, the extent of large unroaded habitat patches available to wolverines. Elk security analysis is based on the entire landscape (232,836 acres) and reflects the traditional security analysis of Hillis <i>et al.</i> 1991.				

Wolverine habitat has been mapped in the Divide Landscape – South and includes areas of persistent spring snow (Copeland *et al.* 2010), and primary, maternal, and female and male dispersal habitat (Inman *et al.* 2013) (Table 136 and Figure 77).

Table 136. Acres of predicted wolverine habitat by source in the Divide Landscape and project area.

Habitat	Divide Landscape - South	Project Area	Source
Areas of persistent spring snow	47,959	12,152	Copeland <i>et al.</i> 2010
Maternal habitat	40	40	Inman <i>et al.</i> 2013
Primary habitat	16,206	4,169	Inman <i>et al.</i> 2013
Male dispersal	152,013	61,384	Inman <i>et al.</i> 2013
Female dispersal	125,939	35,873	Inman <i>et al.</i> 2013

Areas of persistent snow and maternal habitat basically represent the same concept – reproduction habitat. Although reproduction habitat is broadly mapped, in actuality it is restricted to a narrow range within this larger geographic extent. In Montana, natal dens are located on north aspects in avalanche debris typically in alpine habitats near timberline (Inman *et al.* 2007, pp. 71–72).

Copeland and others (2010) found that virtually the entire reproductive habitat that they studied occurred in areas of persistent spring snow. The strong association with areas of persistent spring snow as denning and year round habitat may be based on the fact that these areas are often removed from human use and habituation. The areas of persistent spring snow also represent yearlong habitat which along with the primary habitat identified by Inman and others (2013) has been identified as necessary for survival. Male and female dispersal habitat is important in restoring wolverines to unoccupied areas of historical range as well as increasing resiliency and genetic diversity (Inman *et al.* 2013).

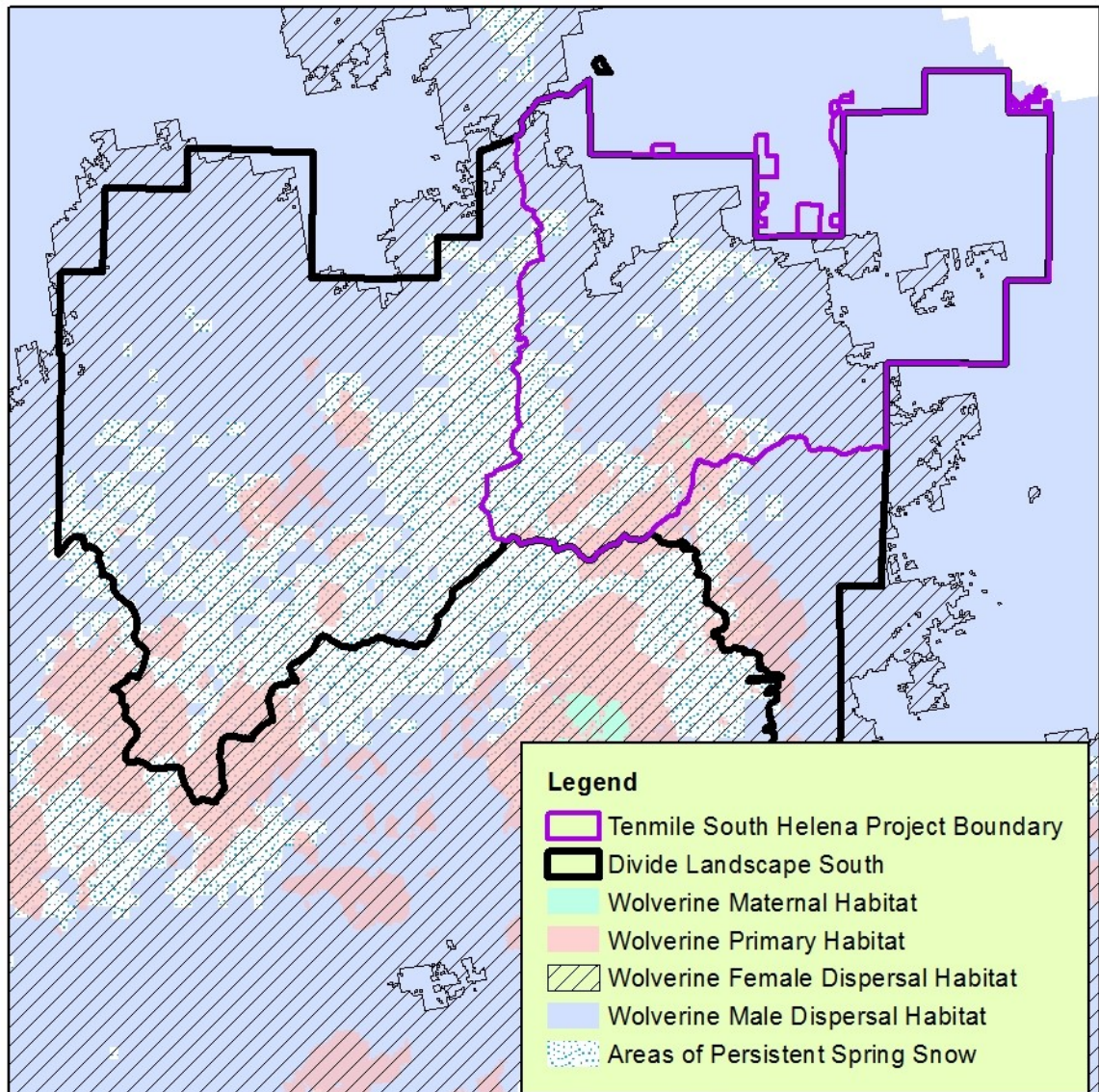


Figure 77. Wolverine habitats in the Tenmile – South Helena project area and in the Divide Landscape – South

Wolverine Occurrence in the Landscape

Reports of wolverines in the Divide landscape have been infrequent but consistent over the past two decades. Prior to 2007, a majority of observations came from long-term residents in upper Telegraph Creek. Other reports came from around Jericho Mountain, the Occidental Plateau, and Lava Mountain in the southern part of the landscape and from the upper Little Prickly Pear drainage in the north. Observations have been made in all seasons: on snowmobile routes in winter, along roads and hiking trails in summer, around cabins in spring and fall, and in backcountry areas during hunting season. In 1995, a wolverine was trapped in Cataract Basin on the Beaverhead-Deerlodge NF just south of the Helena NF boundary.

More recently, winter tracking surveys by Wild Things Unlimited (Bozeman, MT) have found wolverines along the Continental Divide both north and south of Highway 12 and in the eastern half of the Little Blackfoot watershed over a 6-year period (2007-2013).

DNA analysis of scat and hair has verified the presence of 2 male wolverines (Gehman et al. 2009, p. 5; Pilgrim and Schwartz 2008; Pilgrim 2009). These animals have ranged widely in the central and southern parts of the Divide landscape and exhibit movement and behavior patterns consistent with those of local residents rather than those of transients moving through a linkage zone. In 2009, one animal was tracked through the town of Elliston and over to the Little Blackfoot River Road, where it continued to investigate the peripheries of residences, outbuildings, and other trappings of settlement. Track patterns suggest that individuals other than the two males may be present as well, but, to date, none have been verified. No females have been identified and no evidence of breeding has surfaced.

In the fall of 2008, a hunter photographed a large adult wolverine on an elk gut-pile in the vicinity of Greenhorn Mountain, about 5 miles northeast of Austin. Track surveys in the winter of 2008-2009 identified fresh wolverine sign in this area as well, and it is likely that the photograph is of one of the resident males that have been tracked by Gehman and his crews [Figure 78].



Figure 78. An adult wolverine photographed by a hunter near Greenhorn Mountain 11 miles north of the Tenmile – South Helena project area in the fall of 2008. This is probably one of the resident males tracked through the project area by Wild Things Unlimited 2007-2012.

Wolverine Status in the Project Area

Wolverines have been reported in the project area, primarily in the vicinity of Jericho Mountain (Gehman et al. 2010). The majority of wolverine detections have been

reported just north of the project area in the upper Little Prickly Pear drainage and west of the project area in the Telegraph Creek and Little Blackfoot drainages [see Gehman et al. 2008, 2009, 2010, 2012, 2014]. These surveys from 2008-2012 continued to locate wolverines in the same general areas as in previous years. So, it is likely that wolverines have been resident in the Divide landscape in low numbers for several years. Breeding activity, however, remains an unknown quantity.

Environmental Consequences

The following measures are used to evaluate the effects of the Alternatives on wolverines and their habitat.

Desirable Wolverine Habitat Conditions

- ✓ Undisturbed primary habitat
- ✓ Effective habitat connectivity

- Acres of primary habitat affected in the project area
- Effects of activities on wolverine dispersal and habitat connectivity

Effects Common to All Alternatives

There are no effects with regards to wolverine that are common to all alternatives other than succession and natural disturbance processes that would continue through time.

Effects Common to All Action Alternatives

Timber harvest is proposed in modeled primary and male and female dispersal habitat and in areas of persistent spring snow in both action alternatives. There are no treatments proposed in wolverine maternal habitat. Vegetation management alone would not affect the wolverine; however, there is the potential for disturbance to wolverines that may be present in the project area, albeit negligible.

Wolverine dispersal and habitat connectivity should not be affected by the proposed management activities. The Tennile – South Helena project area comprises heavily roaded areas and unroaded areas; wolverines that may occur in the project area have most likely adjusted their movement patterns to account for current conditions.

Alternative 1

Direct/Indirect Effects

Alternative 1 should have no direct effects to wolverines that may occur in the project area. As the dead trees associated with the mountain pine beetle-fall to the ground, wolverines may need to re-adjust movement patterns to account for potential barriers created by large levels of down woody debris. Plenty of opportunities for movement will continue to be available in the non-forested, high ridge country.

No Action Alternative Cumulative Effects

While there can be no cumulative effect from no action being taken, a discussion of the likely trajectory of wolverine habitat may prove beneficial. Alternative 1 maintains the status quo with regards to landscape level effects on wolverines. Mountain pine beetle related mortality is resulting in areas of early seral forests similar to those created by wildfire; furthermore, the dead trees, once they fall, would add to the down woody debris created by those wildfires.

Alternatives 2 and 3

Direct/Indirect Effects

Wolverine habitat in the project area has been classified as having areas of persistent spring snow, primary and maternal habitat, and dispersal habitat. These different classifications are the result of different prediction models and generally are overlapping. Several treatment units are located within wolverine habitat as described in Table 137. The acres of treatments are duplicative where the habitat values overlap. There are no treatments proposed in maternal habitat.

Table 137. Treatment units located in predicted wolverine habitat.

Treatment Type	Alternative	Habitat			
		Areas of snow persistence	Primary wolverine habitat	Female Dispersal Habitat	Male Dispersal Habitat
Regeneration harvest	Alternative 2	2,035	360	3,345	4,232
	Alternative 3	1,397	91	2,311	2,449
Intermediate harvest	Alternative 2	351	152	1,802	4,576
	Alternative 3	369	161	1,773	3,664
Precommercial Thinning	Alternative 2	92	43	134	471
	Alternative 3	81	43	109	445
Prescribed fire	Alternative 2	493	106	5,473	15,025
	Alternative 3	329	132	3,294	11,549

Several treatment units in alternative 2 overlap with the areas of persistent spring snow; less so in alternative 3. Most of the primary habitat would have some type of treatment in alternative 2; again, less so in alternative 3. All of the units in alternative 2 and 3 overlap with male and female dispersal habitat do to the ubiquitous nature of that habitat.

Little is known about how wolverines respond to the types of activities that are planned in the Tenmile – South Helena project. However, wolverines have been documented to reproduce and survive in areas with high human use and activities (Federal Register 2013, page 7877) suggesting that wolverines can survive in areas with human use and disturbance.

Although wolverines are frequently found in forested habitats, most researchers have concluded that they are not necessarily dependent on specific vegetation patterns of the sort that are typically manipulated by timber harvest, prescribed fire, or other forest management practices [see USFWS proposed listing of the wolverine: <http://federalregister.gov/a/2013-01478>]. While wolverines avoid active management operations in the forest (logging, burning, and associated activity), they often move through and make use of the new open environments once humans have abandoned the areas, particularly if prey is readily available.

Hornocker and Hash (1981) noted that wolverines in Montana cross new clearcuts, but usually at a brisk pace. On the other hand, they saw no differences in movements, habitat use, or behavior between wolverines occupying the half of their study area that had been

logged and the half that was not. Copeland (1996) observed wolverines in Idaho traveling through and foraging in recently burned forest in spite of lost canopy cover. Krebs et al. (2007) found that male wolverines used recently logged areas in British Columbia but that females were less likely to do so. They theorized that this reticence was more an aversion to human activity and infrastructure than to vegetation patterns. Wolverines are more apt to use these areas once the new openings begin to fill in with seedlings and saplings.

Banci (1994) concluded that travel corridors between large unroaded refuges need not possess the optimal vegetation and other habitat attributes needed to support self-sustaining wolverine populations. She noted that females appeared more hesitant to move through large blocks of marginal habitat than males. Whereas extensive human settlement and highways may hinder or divert long-distance movement by wolverines, topographic features and vegetation patterns (including those generated by timber harvest) appear not to do so. Lyon and others (1994) indicate that while habitat change produced by logging is obviously disruptive to movement patterns of marten and fisher, it appears to be much less so for wolverine.

Treatments planned in male and/or female dispersal habitat are not expected to significantly alter use of the project area by wolverines. Wolverines may adjust movement patterns to avoid the activities associated with the planned treatments; however, these impacts should only last while activities are ongoing. A majority of the project area would remain untreated thereby providing opportunities for wolverines to move through the project area unencumbered by human activity. Given that harvest and prescribed fire patterns would match historical patterns; these anticipated shifts would be no greater than what wolverines would typically do after small to moderate-sized natural disturbances.

Key sites of particular interest to wolverines—primarily riparian areas—would be left mostly intact and the capacity of these sites to produce prey and other food sources useful to wolverines would not be impaired. Riparian areas would be buffered as part of project-level design. Mechanical equipment is limited in these areas as well as tree removal.

Some of the planned treatments that are several hundred acres in size could discourage wolverine foraging. Elsewhere, in smaller treatment units, wolverine foraging most likely would not be discouraged if food sources are present. Nor would they prevent wolverines from crossing the openings when moving through the area. As previously mentioned, wolverines have been observed crossing new openings created by logging and are known to continue using newly harvested areas in much the same way as they do adjacent unlogged areas (Hornocker and Hash 1981).

As the USFWS has noted in its proposed rule to list the wolverine, “[w]olverines are not thought to be dependent on specific vegetation or habitat features that might be manipulated by land management activities, nor is there evidence to suggest that land management activities are a threat to the conservation of the species” [<http://federalregister.gov/a/2013-01478>].

The project includes road reconstruction and creation of temporary roads that will be decommissioned after the project is implemented. As indicated above, two-lane highways or roads with less improvement are not absolute barriers to wolverine movement and dispersal (Federal Register 2010 page 78048). Because these roads are temporary and/or not improved, they are not expected to be a barrier to wolverine movements.

Action Alternatives Cumulative Effects

Cumulative effects are the incremental impacts that the direct and indirect effects associated with the action alternatives have on wolverine habitat in the context of the myriad of other past, present, and future effects on wolverine habitat from unrelated activities. The cumulative effects analysis considers spatial and temporal boundaries, how past activities have contributed to the existing condition, and whether the ecosystem can accommodate additional effects. Table 138 summarizes the key items that are taken into consideration for the cumulative effects analysis for wolverine habitat. See also Appendix E to the Wildlife Report, Cumulative Effects, for more information.

Table 138. Cumulative effects considerations for wolverine habitat in the Divide Landscape – South.

Parameter	Discussion
Spatial Boundary	The spatial boundary is expanded to the point at which wolverine habitat is no longer measurably affected. The Divide Landscape - South satisfies this requirement because this is the scale at which the effects to wolverine habitat can be examined at the stand or treatment unit. The Divide Landscape - South also provides a sufficient landscape to assess pattern and structure in the context of larger processes.
Temporal Boundary	The temporal boundary ranges from the early 20 th century to those future projects and effects that are either listed in our SOPA or are planned or implemented on private land within the Divide Landscape-South.
Past Activities and Existing Condition	The effects of past activities are reflected in the existing condition. Of importance to wolverine are activities that reduce populations directly or indirectly through human activities.
Activities Considered in Cumulative Effects	Past activities that are included in the cumulative effects analysis include trapping, road construction, area snowmobile closures, and the Statewide OHV Plan. Ongoing and future activities include trapping, recreational activities, Divide Travel Plan, small mining operations, the Telegraph MPB Salvage project, and private land development. Climate change is also a concern for wolverines.
Measurement Indicators	Measurements include effects to natal denning habitat and habitat connectivity.
Thresholds	Thresholds are based on sensitive species determinations.
Methods	Past, ongoing, and reasonably foreseeable activities are described qualitatively based on impacts to natal denning habitat and wolverine connectivity.
Assumptions	The assumptions for describing past, ongoing, and foreseeable activities are based on wolverine research.

Past Activities

Wolverines had been heavily trapped in the early part of the 20th century; since that time populations have rebounded as predator control efforts subsided and trapping regulations become more restrictive (Aubry et al. 2007, p. 2151).

Activities that have locally reduced the effectiveness of potential wolverine habitat to one degree or another include: numerous road permits allowing access across HLCNF land to private holdings; retention of private recreational residences on HLCNF land (esp. in the linkage zone at MacDonald Pass); small mining operations (under the 1872 Mining Act) in areas where wolverines have been observed; construction and maintenance of communications sites and power lines; development and retention of numerous snowmobile trails in potential wolverine habitat; retention of numerous dispersed camping sites and unrestricted back-country recreational use.

These activities increase, to one degree or another, the potential for wolverine-human encounters and reduce the country through which wolverines are able to roam generally free from human influence. Few, if any, of these enterprises are likely to disrupt wolverine natal denning sites—the exception being large-scale, year-round mining operations at high elevation (the Luttrell Pit at the southern edge of the analysis area being the only current example). Other activities that may approach potential denning habitat do not occur during the wolverine denning period (winter and early spring). High-elevation snowmobile routes and play areas, which have caused problems for

denning wolverines in other parts of the northern Rockies, are not located near perspective denning sites in the Divide landscape - South.

New road systems associated with timber sales, some of which remain open to vehicle use, have reduced unroaded wolverine habitat and increased access for trappers. These roads have reduced unroaded wolverine habitat and have increased access for trappers. These include Bison Creek, Mike Renig Gulch-Hahn Creek, Slate Creek, Lump Gulch, Ophir Creek-Cave Gulch, Deadman, among others. Timber harvest itself has a mixed effect on wolverine habitat and the ability of wolverines to avoid humans and find food. In general, projects that have removed good quality cover and complex understory habitat supporting diverse potential food sources have been detrimental. Those that have improved habitat productivity by opening up dense, depauperate forest and increasing edge and ecotone may be beneficial.

Area closures for snowmobiles in the Electric Peak and Lazyman-Black Mountain Roadless Areas; establishment of the Statewide OHV Plan, which prohibits riding off established motor routes; road and motor trail closures associated with timber harvest projects (Clancy-Unionville, Sound Wood, Mullan Pass, Lava Mountain, Treasure Mountain). These decisions have expanded blocks of non-motorized habitat and potential wolverine refuges.

Ongoing Activities

Private land development (primarily rural home building) is continuing to create more sites that prove problematic for animals attempting to move through or occupy the landscape (barriers to movement, habitat loss, food attractants, dogs). Many of these developments are at low elevation in areas seldom traversed by wolverines, but some are associated with higher elevation inholdings (Telegraph Creek, Ontario Creek, Little Blackfoot, upper Tenmile) and may create problems. The town of Rimini and a number of dwellings on mid-high elevation Forest inholdings occupy ground that might otherwise be favorable as wolverine habitat. Cabins used only seasonally or intermittently throughout the year, especially those that harbor stored food, may attract wolverines.

The Red Mountain Flume/Chessman Reservoir Project, located east of the Continental Divide, is resulting in the removal of 490 acres of primarily dead lodgepole pine. While this project includes harvest of dead trees that could conceivably provide woody debris accumulations in which wolverines might den, the potential for future denning in the proposed harvest units once trees fall is low (elevations are too low, there are no avalanche chutes or large rockslides nearby, density of large dead trees is generally too low, most areas are too close to regular human activity). Wolverines could use accumulated deadfall, if not for denning, then for resting or escape cover. Removal of dead trees could thus influence future movement patterns.

Reasonably Foreseeable Activities

Reasonably foreseeable activities on the Helena NF that may affect wolverine habitat, especially dispersal include the Divide Travel Plan and the Telegraph MPB Salvage project. The Divide Travel Plan would result in the closure, at least seasonally, of several miles of roads that are currently open. This would be beneficial to wolverine by

providing large, unroaded blocks of habitat. Where roads remain open, wolverine movement patterns have most likely already been adjusted. The Telegraph project could result in openings that could cause wolverines to shift their movement patterns.

The primary foreseeable activity on non-Forest land within the cumulative effects area that can affect wolverines is the ongoing development of private inholdings (building construction, road building, forest clearing, local mining, and general human activity).

Cumulative Effects Conclusions for the Action Alternatives

Implementation of either of the action alternatives may contribute to the effects associated with past, ongoing, and reasonably foreseeable activities. However, given the abundance and wide distribution of non-harvested areas, the low density of the local wolverine population, and the adaptability of wolverines to a wide array of habitat formations, it is highly unlikely that the proposed projects would have any major influence on the ability of wolverines to continue to occupy the landscape.

Irreversible and Irretrievable Commitment of Resources

There are no irreversible or irretrievable commitments of resources.

Conclusions

Overall, implementation of either of the action alternatives should have minimal on wolverine habitat. According to the USFWS 12-month review, “[i]t is clear that wolverines can coexist with some level of human disturbance and habitat modification. How much is too much is not known. The proximity of wolverine habitats to areas heavily or moderately used for dispersed recreation needs more study, especially where there is overlap during the denning season. What little information exists suggests that wolverines can adjust to moderate habitat modification, infrastructure development, and human disturbance” (USDI FWS 2010).

Furthermore, the 2013 proposed wolverine rule states that “[w]olverines are not thought to be dependent on specific vegetation or habitat features that might be manipulated by land management activities, nor is there evidence to suggest that land management activities are a threat to the conservation of the species” (Federal Register 2013, page 7879). “The available scientific and commercial information does not indicate that other potential stressors such as land management, recreation, infrastructure development, and transportation corridors pose a threat to the DPS” (Federal Register 2013, page 7880).

The desired condition for wolverine habitat includes undisturbed primary habitat that remains free from disturbance and intact habitat connectivity that facilitates unimpeded movement. Although both action alternatives include treatments in primary habitat, the research supports that wolverines would not permanently avoid these areas. The action alternatives are not expected to result in barriers to dispersing individuals since a majority of the project area under either alternative would remain untreated.

Forest Plan Consistency

The wolverine is listed as a sensitive species in Region One. Federal laws and direction applicable to sensitive species include the National Forest Management Act (NFMA), the

Forest Service Manual, and the Helena National Forest Plan. The NFMA requires the Forest Service to “provide for diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives” [16 USC 1604(g)(3)(B)].

Section 2672.4 of the Forest Service Manual provides direction that biological evaluations will be prepared for all Forest Service planned, funded, executed, or permitted programs and activities for possible effects on endangered, threatened, proposed, or sensitive species. The objectives of the biological evaluation include ensuring that Forest Service actions do not contribute to loss of viability of any native or desired non-native plant or contribute to animal species or trends toward Federal listing of any species.

All alternatives would be consistent with the NFMA requirement for diversity of plant and animal communities and ecological sustainability. At the Helena National Forest Scale, key wolverine habitat is protected by wilderness and roadless designation as well as unroaded areas. At the Region 1 scale, the majority of modeled wolverine habitat is protected within the Bob Marshall Wilderness complex and Mission Wilderness, with additional habitat in Glacier National Park providing connectivity to Canada. Therefore, while climate change and other activities outside of Forest Service control may impact wolverines or their habitat, effects would be negligible and this project “***may impact individuals but would not likely result in a trend toward federal listing or threaten viability for the population or species***”. See also the Biological Evaluation section and Appendix D to the Wildlife Report, Viability Analysis.

There are no specific Forest Plan standards applicable to management of wolverine habitat.

Management Indicator Species

The Helena Forest Plan requires that populations of “indicator species” be monitored in order to measure the effects of management activities on representative wildlife habitats [those most likely to be affected by Forest management] (HFP, p. II-17). This standard represents the primary mechanism that most Northern Region Forests have used to implement the NFMA mandate that viable populations of all native and desirable non-native wildlife species be maintained. If populations of management indicator species (MIS) remain viable, it is assumed that the habitats on which they depend are sufficiently robust to maintain the population viability of other wildlife species dependent on those habitats.

Only the goshawk is discussed in detail in the following section. The pileated and hairy woodpeckers and American marten are described above in the Snag and Down Woody Debris section.

The Forest Plan also designates indicators for threatened and endangered species (grizzly bear, wolf, bald eagle, peregrine falcon—species listed at the time of Forest Plan release in 1986) and hunted species (elk, mule deer, bighorn sheep). The status of species in these groups is discussed elsewhere in this report.

Northern Goshawk

Affected Environment

Habitat Use and Population Processes

The northern goshawk (*Accipiter gentilis*) is the most widely distributed accipiter (hawk) worldwide. In North America it resides from Alaska east to Labrador and Newfoundland and south into the U.S. of New England, New Jersey and into the Appalachian Mountains of Maryland and West Virginia. The northern goshawk also occurs along the northern tier states of the U.S., from New York to Minnesota, and in the Rocky Mountain States, and south down into Mexico.

The northern goshawk is the only large diurnal raptor that is adapted to interior forest environments. Common elements of goshawk habitat are large blocks of older forest, tight groups of large nesting trees, abundant prey (squirrels, hares, grouse, larger songbirds), and mid-level flight space that facilitates in their search, capture and transport of prey. In most of the Rocky Mountain region optimal goshawk habitat is provided by old-growth Douglas-fir and ponderosa pine forest – and for that reason the goshawk was chosen as a management indicator for those habitats when the Helena Forest Plan (and many other Northern Region Forest Plans) was written. Since then (1980s), however, copious amounts of field research, and survey work, have shown that goshawks are much more versatile in their use of habitats than originally thought. Goshawks do have rather specific habitat requirements for nesting and post-fledging (close-canopied mature forest, e.g.) but otherwise reveal themselves as forest generalists, thus the goshawk is not particularly useful as an old-growth indicator (Braun et al. 1996; Reynolds et al. 1992; Clough 2000; McGrath et al. 2003).

Surveys over the past 15 years on the Helena, Beaverhead-Deerlodge, Lewis and Clark, and Medicine Bow National Forests have found that goshawks will also nest and forage in stands of mature lodgepole pine, as long as the basic structural attributes they need are in place and prey is adequate (Lemke 1993; Squires and Ruggiero 1996; Clough 2000). In the more fragmented forest environments east of the Continental Divide, where mountain and prairie habitats can be intermixed, goshawks often occupy mosaics of forest and grassland or a mixture of different forest seral stages. They are also drawn to aspen stands because of the robust populations of prey species that aspen habitat supports (grouse, cottontails, snowshoe hares, ground squirrels, mourning doves, flickers, small owls, and numerous large songbirds and woodpeckers). Goshawks are also capable of foraging through open parks in woodlands, and along forest edges, and in certain circumstances do so on a regular basis (Younk and Bechard 1994). But regardless of the structural diversity of foraging habitat, and of goshawk ranges in general, nesting and post-fledging habitats usually require cohesive stands, or at least substantial patches, of dense-canopied mature forest.

Goshawks can use small patches of mature habitat located within a mosaic of varying age class and structured habitats and still meet their nesting requirements (Samson 2006). Squires and Ruggiero (1996) found that goshawks were adept at locating suitable microsites within lodgepole pine stands that otherwise did not appear to be suitable for nesting. This was further substantiated by McGrath et al. (2003); they found that many

of the goshawks they studied nested in non-typical habitat, that is, they were unable to differentiate between actual nest sites and random locations in a “blind sample comparison.” In Nevada, Younk and Bechard (1994) studied goshawks that nested in aspen stands and preyed mostly on ground squirrels in shrub-steppe habitat. In the upper Clark Fork drainage of Montana, Clough (2000) found no difference in goshawk nest density between drainages that were heavily-forested and un-fragmented, versus drainages that were heavily-fragmented with old clearcut openings. While habitat structure and prey abundance typically determine whether or not a given area can be occupied, nest distribution across the landscape is usually determined by territoriality, and nest success is usually determined by spring weather (Joy 2002; Reich et al. 2004).

Extensive survey work over the past 18 years has demonstrated that goshawks are widespread across the “eastside” Forests of Montana (the Helena, Lewis and Clark, Beaverhead-Deerlodge, Gallatin, and Custer National Forests). These “eastside” goshawks typically maintain large home ranges – estimated at about 5,000 to 6,000 acres per goshawk pair (Reynolds et al. 1992; Clough 2000) – and as a result population densities of “eastside” Forest goshawks are naturally low, even where suitable habitat is abundant. However, in areas with high prey populations and optimal habitat structure, home ranges may be smaller and overlap. Goshawks can hunt through a diversity of habitat formations as long as prey is adequate, and most of a goshawk’s home range consists of diverse foraging habitat and other sites unsuitable for nesting (Reynolds et al. 1992).

Nesting stands and post-fledging areas (PFAs) require more specialized habitat structure, and make up a much smaller portion of the home range, usually no more than a few hundred acres. On the Helena NF, nest sites and the surrounding PFAs are sometimes less than 100 acres in size. These are forested areas dominated by mature trees with enough closed canopy to provide screened nesting sites, suitable microclimate, abundant prey, and security from open-forest predators.

Loss of habitat – such as to clearcut logging, stand-replacement fires, and other agents that fragment forest canopies – is a primary threat to goshawk production. Goshawks are also sensitive to human disturbance around nest sites, often aggressively defending their nest and the larger and surrounding PFA, where their newly fledged young are raised. Adult goshawk pairs may occupy the same nest stand over consecutive years but rarely do they occupy the same nest on consecutive years. Sometimes they will return to an older nest, which they had used 2 or 3 years earlier, which they will refurbish and reuse. And it’s not uncommon for them to move to a new nest stand elsewhere in their home range. Because of their large home ranges and their natural tendency to cycle among different nest sites between years, goshawks are able to adapt to environmental changes (such as timber harvest, fire and insect outbreaks) by moving to adjacent undisturbed sites.

Goshawk Populations

The only nation-wide estimates of goshawk population trends has come from the recently-released results of the North American Breeding Bird Survey (BBS), 1966-2013. These data indicate northern goshawk numbers declined by approximately 1 percent in the Northern Rockies during that (1966-2013) period (Figure 79 and <http://www.mbr->

pwrc.usgs.gov/bbs/bbs.html). However, Andersen et al. (2005, p. 7) conclude that “BBS data are inadequate to estimate population trend for goshawks both because the number of routes on which goshawks are detected, and the encounter rate of goshawks on these routes, are too low”. The BBS also cautions that their data have deficiencies. In particular, (1) the regional abundance is less than 0.1 birds/route (very low abundance), (2) the sample is based on less than 5 routes for the long term (very small samples), and (3) the results are so imprecise that a 5 percent per year change would not be detected over the long-term (very imprecise).

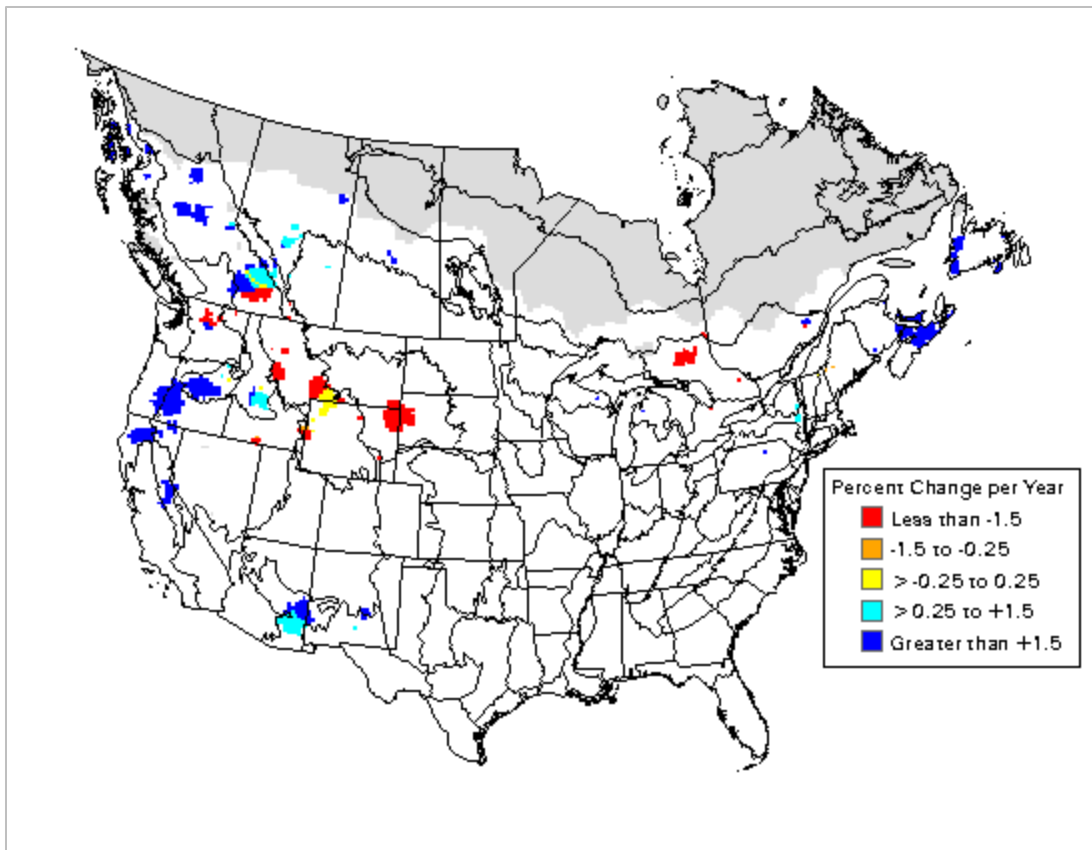


Figure 79. BBS Trend Map, 1966 - 2013 Percent change in trend for northern goshawks (Source: Sauer et al. 2014).

Some authors had hypothesized that goshawk populations may be declining (Bloom et al. 1986 as cited in Andersen et al. 2005, Crocker-Bedford 1990, Zinn and Tibbits 1990 as cited in Squires and Kennedy 2006). Hoffman and Smith (2003) analyzed migration data and concluded that uncertainty exists relative to the status of goshawk populations in the west. Kennedy (1997) and Andersen et al. (2005) concluded that current sampling techniques may be inadequate for determining if goshawk populations are declining, increasing, or remaining stable. Squires and Kennedy (2006) conclude that this difficulty is due to several factors including: (1) goshawks are secretive and difficult to survey, and (2) many studies have small sample sizes.

While the BBS shows a 1 percent decline in overall population trend, the Montana Natural Heritage database lists the global status of northern goshawks as ‘G5’, which is “Common, widespread, and abundant (although it may be rare in parts of its range). Not vulnerable in most of its range”. The goshawk’s statewide status is ‘S3’, which is

defined as “potentially at risk because of limited and/or declining numbers, range, and/or habitat, even though it may be abundant in some areas”. See <http://fieldguide.mt.gov/displayClasses.aspx?Kingdom=Animalia>.

Goshawk Management

The goshawk has been a management indicator species for old-growth forests since the release of the Helena Forest Plan in 1986. Subsequently, between 1991 and 1997, environmental organizations submitted petitions to have the goshawk listed under the Endangered Species Act, but in 1998 the USFWS concluded that goshawks were well distributed throughout their historic range and that there wasn't evidence of declining population trends thus listing was not warranted (USDI FWS 1998). The goshawk was also listed for several years as a sensitive species in the USFS's Region 1 (the Northern Region) – a status that ended in 2006 for the same reasons cited by the USFWS in their declination to add the goshawk to the Endangered Species list in 1998. The species, however, remains a focal point of keen interest for wildlife biologists, forest managers, and certain segments of the public [see USDA 2009c, p. 4-6].

Regional Guidance

In recent years, guidance for goshawk management in USFS Region 1 is a response to a number of findings, summarized in the Northern Goshawk Northern Region Overview (Brewer et al. 2009, p. 30-31):

- The species is considered globally secure; but because some segments of the Montana population show limited numbers or declining habitat, regular monitoring of local populations will continue to be needed.
- The USFWS has concluded that “the goshawk population is well distributed and stable at the broadest scale” [63 Fed. Register 35183].
- Breeding goshawks and their habitat appear abundant and well-distributed across FS Region 1.
- Each National Forest in Region 1 appears to have more than enough habitat to maintain a minimum viable population (Samson 2006).

Helena National Forest Guidance

Over the last 20 years, long-term survey efforts (systematic searches for new nests and monitoring of known nests) have revealed that goshawk home ranges are quite regularly distributed across most of the forested areas of the Helena NF, as well as across virtually every project area. Even though not all potential home range areas have been surveyed, the nest sites that have been identified were/are typically spaced about 3-4 miles apart. In any given year not all nest sites have been found to be active (either because goshawks were not there or surveys did not locate them). And after several years of fieldwork, the pattern of active and inactive nests has pointed to a well distributed array of sites capable of supporting breeding goshawks. These positive results have not lessened survey efforts on the Forest; the goshawk remains a species managed using a fine-filter approach, which requires considerable attention being paid to site-specific detail over broad areas. And now, with the mountain pine beetle epidemic having substantially modified the kinds of nesting and foraging habitats available to goshawks, regular monitoring is of particular

value in determining how goshawks are adapting to these changes, and how “fine-filter” management needs to respond.

Although the 1986 Forest Plan’s intention was for the goshawk to be an indicator of the health of old-growth forest habitats, in practice goshawks are managed more as a “species of special concern”, whose habitat needs are accommodated regardless of whether the result leads to optimal old-growth forest management. In terms of specific habitat management tactics, over the last two decades many forest managers in the northern Rockies have drawn upon the detailed guidelines from Reynolds et al. (1992). But since those guidelines were designed for goshawks in the southwestern (U.S.) ponderosa pine forests, the HLCNF also supplements with more local information and guidance provided by Clough (2000), Samson (2005), and USDA (2009c).

Southwestern U.S. Management Guidelines

Reynolds et al. (1992, p. 3-4, 13-15) defined 4 key habitat areas for goshawks: nest stands, post-fledging areas (PFAs), foraging areas, and the nesting home range as a whole. The nest area is the center of all activity associated with breeding. Reynolds and his team determined, through radio telemetry, that in Arizona’s ponderosa pine forests breeding goshawks typically utilize a nest area of about 30 acres in size. Nest areas inevitably include one or more stands dominated by large old trees with dense canopy closure. In some cases the bulk of the nest area may be occupied by dense, old-tree habitat, but more often these sites are scattered throughout the nest area, connected by a larger matrix of younger trees with more irregular canopy closure. Reynolds et al. (1992) also point out that most goshawks have 2 to 4 alternative nest areas/sites in their home range, and recommend that 180 acres of nest area be retained when managing goshawk habitat.

Post-fledging areas (PFAs) surround nest areas and provide a haven in which young birds can develop flying and hunting skills. In Arizona PFAs range from about 300 to 600 acres in size (420 acre average) and encompass a variety of forest types and canopy covers with enough vegetative diversity to support a good prey base. The PFA (and nest area) is the area defended by adult goshawks during the nesting season. Foraging areas surround PFAs and average roughly 5,400 acres in size. Goshawk foraging areas are typically dominated by mature forests with a relatively open understory (to allow for more efficient hunting), and because of the relatively large size of foraging areas they usually encompass a diversity of habitat formations, including open-grown forest, grassland and shrub-lands, meadows, early-seral forested areas, clusters of dead trees, and human-made openings. Goshawks prefer to forage in mature forest, but because they are opportunistic hunters it’s felt that the areas in which they choose to forage are governed more by prey density than by habitat structure (Reynolds et al. 1992, p. 4, 14-19). The goshawk’s breeding home range consists of the sum of the above 3 component areas. Reynolds et al. (1992) recommend managing for home ranges of about 5,820 acres in the southwest. The actual size of a home range, however, is a function of the availability and distribution of nesting habitat and the quality of the foraging area; home ranges are likely to be larger where prey is less abundant, less diverse, and more erratically distributed.

Other Management Reviews

The habitat requirements of goshawks, and the role that these habitat needs should play in directing forest management, have not been without controversy. In a comprehensive status review of the species in 1998, the USFWS found that while the goshawk typically uses mature forests or larger trees for nesting (the nest area), it can otherwise be considered a forest habitat generalist that makes use of a variety of forest types and ages. The review found no evidence that the goshawk is dependent on large, unbroken tracts of old-growth or mature forest (USDI FWS 1998).

Conversely, Greenwald et al. (2005) concluded, in a literature review of selected studies, that goshawks select mature to old-growth forests and criticized the management recommendations of Reynolds et al. (1992). Reynolds et al. (2005), however, rebutted Greenwald's conclusions in a comprehensive review of literature that supported the USFWS review. That rebuttal contended that Greenwald's criticisms were based on misunderstandings of the desired goshawk habitats outlined in Reynolds et al. (1992), under-appreciated the variation in vegetation structure among forest types and seral stages used by goshawks, disregarded the ecological factors limiting goshawks, failed to understand the dynamic nature of forest habitats, and was based on an incomplete review of the literature (Reynolds et al. 2008).

Local Considerations

At the project level goshawk management tends to focus on maintaining the integrity of local nest areas and post-fledging areas. Foraging areas are large and often amorphous to a degree that researchers and fieldworkers are often unable to detect any differences between habitat in the foraging area and that of surrounding areas (McGrath et al. 2003). As a result, unless a project is altering major blocks of vegetation over an area equivalent to the size of a goshawk home range, and in a way that would substantially limit goshawk foraging options, the composition of foraging areas is seldom mapped out in detail.

While Reynolds et al. (1992, p. 20-30) have provided detailed estimates as to the optimal characteristics of goshawk breeding ranges in the Southwest, survey and monitoring on the Helena NF have often found goshawks occupying home ranges with attributes uncharacteristic of those described by Reynolds et al. Local goshawks appear to be quite flexible relative to the size and composition of the habitat units in which they select, reside, and successfully raise young – often nesting in smaller, more fragmented stands, and foraging in more open environments than has been considered the norm elsewhere. This flexibility, however, is now being severely tested with large portions of the forest overstory dead and devoid of foliage. The chances of local goshawks finding anything approaching the optimal habitat described in the Southwest (US) guidelines are slim. We have applied the southwest forest guidelines of Reynolds et al. (1992) to the Tennile – South Helena project area for purposes of providing perspective. But the usefulness of this exercise for determining how goshawks are using available resources in this changing environment is somewhat limited.

Population Status and Habitat in the Project Area

Goshawk Monitoring

Regular goshawk inventory and monitoring has been ongoing on the Helena NF since the early 1990s and within the Tenmile – South Helena project area since the mid-1990s. Figure 80 shows, and Table 139 summarizes the goshawk survey efforts from 1992 through 2014. These survey efforts consisted of surveying goshawks in past and proposed project areas, surveying goshawks in old growth stands, monitoring of previously identified nest sites, and following-up and field verifying goshawk sightings reported to us via any other means.

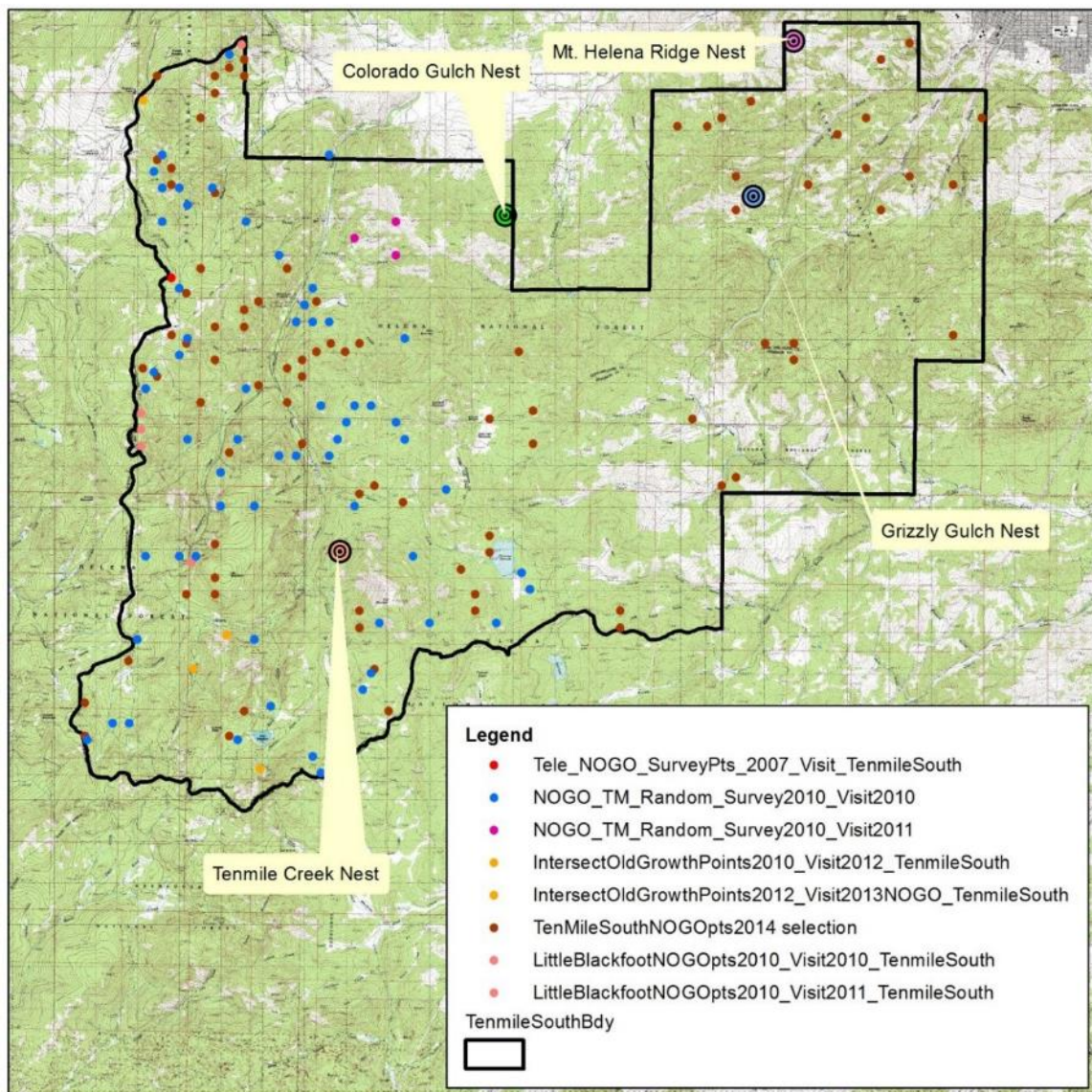


Figure 80. Map showing sites surveyed for northern goshawks in the Tenmile – South Helena project area since 2007. Legend labels reflect naming convention used in the geographic information system (GIS).

Over the years, while conducting goshawk and old growth surveys, or when following up on goshawk sightings made by others, 4 goshawk nests have been found in the Tenmile – South Helena project area, listed in Table 139 and Table 140, and shown in Figure 80 and

Figure 81. From south to north across the project area (Figure 80 and Figure 81) the four known nests are: Tenmile Creek Nest, Colorado Gulch Nest, Grizzly Gulch Nest, and Mt. Helena Ridge Nest. The location of the Tenmile Creek Nest is in the upper reaches of Tenmile Creek, which is in the southwestern quarter of the project area. This nest was first located in 2013, but no activity was detected in 2014. The location of the Colorado Gulch Nest is in Colorado Gulch, which is in the northcentral portion of the project area, and was confirmed as a nest by a private landowner in 2005, but not re-substantiated since then. Location of the Grizzly Gulch Nest is on the west side of said drainage, in the northeast quarter of the project area, and it was discovered in 2014. Location of the Mt. Helena Ridge Nest is on said ridge, south of and above Tenmile Creek, in the northeast corner of the project area, and it was found in 2005, but not revisited since.

Table 139. Summary of goshawk survey efforts on the Helena NF, 1992-2014

Location	Year Surveyed	Type of Survey	Results
Sweeny Creek	1992	Field reconnaissance	Prob. active nest; goshawk seen.
Upper Lump Gulch	1992	Field reconnaissance	Response.
Blackfoot Meadows	1994	Field reconnaissance	Prob. active nest; goshawk seen.
Telegraph Creek	1995	Field reconnaissance	Prob. active nest; goshawk seen.
Brooklyn Bridge*	1996	Field reconnaissance	Prob. active nest; goshawk seen.
Grizzly-Orofino Gulch*	1996	Field reconnaissance	Prob. active nest; goshawk seen.
Jackson Creek	1996	Field reconnaissance	Active nest.
Little Buffalo Gulch*	1996	Field reconnaissance	Prob. active nest; goshawk seen. An active nest was never located although there have been ample goshawk sightings over the years.
Little Corral Gulch*	1996	Field reconnaissance	Prob. active nest; goshawk seen. An active nest was never located although there have been ample goshawk sightings over the years.
South Fork Quartz Creek	1996	Field reconnaissance	Active nest.
Squaw Gulch*	1996	Field reconnaissance	Prob. active nest; goshawk seen.
Rowe Gulch	1997	Field reconnaissance	Response.
Upper Lump Gulch	1997	Field reconnaissance	Prob. active nest; goshawk seen.
Brooklyn Bridge*	1998	Field reconnaissance	Prob. active nest; goshawk seen.
Little Corral Gulch*	1998	Field reconnaissance	Response. Prob. an active nest. An active nest was never located although there have been ample goshawk sightings over the years.

Location	Year Surveyed	Type of Survey	Results
South Fork Quartz Creek	1998	Field reconnaissance	Active nest.
Stemple Pass	1998	Field reconnaissance	Response.
Banner Creek*	1999	Field reconnaissance	Prob. active nest; goshawk seen.
Blackfoot Meadows	1999	Field reconnaissance	Response; prob active nest; goshawk seen.
Mike Renig Gulch	1999	Field reconnaissance	Prob. active nest; goshawk seen; response.
Monarch Creek	1999	Field reconnaissance	Prob. active nest; goshawk seen.
Blackfoot Meadows	2000	Field reconnaissance	Prob. active nest; goshawk seen.
Spring Gulch	2000	Field reconnaissance	Active nest.
Banner Creek*	2001	Field reconnaissance	Prob. active nest; goshawk seen.
Blackfoot Meadows	2001	Field reconnaissance	Prob. active nest; goshawk seen.
Connors Gulch	2001	Field reconnaissance	Response.
Lower Little Blackfoot	2001	Field reconnaissance	Prob. active nest; goshawk seen.
Telegraph Creek	2001	Field reconnaissance	Prob. active nest; goshawk seen.
Blackfoot Meadows	2002	Field reconnaissance	Prob. active nest; goshawk seen.
Connors Gulch	2002	Field reconnaissance	Prob. active nest; goshawk seen.
Little Corral Gulch*	2002	Field reconnaissance	Prob. active nest; goshawk seen. An active nest was never located although there have been ample goshawk sightings over the years.
Lower Tenmile Creek*	2002	Field reconnaissance	Prob. active nest; goshawk seen.
Monarch Creek	2002	Field reconnaissance	Prob. active nest; goshawk seen.
Ontario Creek	2002	Field reconnaissance	Prob. active nest; goshawk seen.
Spring Gulch	2002	Field reconnaissance	Active nest.
Upper Lump Gulch	2002	Field reconnaissance	Prob. active nest; goshawk seen.
Little Corral Gulch*	2004	Known territory	Prob. active nest; goshawk seen. An active nest was never located although there have been ample goshawk sightings over the years. Occupied territory.
Sweeney Creek	2004	Known territory	Occupied.
Brooklyn Bridge*	2004	Known territory	Prob. active nest; goshawk seen, territory considered occupied.

Location	Year Surveyed	Type of Survey	Results
Spring Gulch	2004	Known territory	Occupied.
Upper Lump Gulch	2004	Known territory	No detection.
Monarch Creek	2004	Known territory	No detection.
South Fork Quartz Creek	2004	Known territory	No detection.
Connors Gulch	2004	Known territory	No detection.
PSU 11028	2005	Primary Sample Units – Regional Surveys	No detection.
Elliston Face	2005	Project area	Active nest located.
Colorado Gulch*	2005	Project area	This nest was reported by a private landowner in the vicinity of the nest. We have not been able to find the nest itself although surveys have been conducted in the vicinity, particularly in 2014.
Little Corral Gulch*	2005	Known territory	No detection. Prob. active nest. An active nest was never located although there have been ample goshawk sightings over the years.
Deadman Creek	2005	Known territory	No detection.
Brooklyn Bridge*	2005	Known territory	No detection.
Ophir Creek-Black Mountain	2005	Known territory	No detection.
Mt. Helena Ridge*	2005	Known territory	Goshawk nest found in October of 2005 with goshawk activity nearby; no additional follow-up since 2005.
Kading-Limburger Springs	2005	Known territory	No detection.
Hope Creek/Spring Gulch	2005	Known territory	No detection.
Elliston Face	2006	Known nest	Goshawks detected foraging.
South Helena*	2006	Project area	Potential active nest; goshawks detected foraging.
Little Blackfoot	2007	Planning area	Goshawks detected.
Telegraph	2008	Project area	No detections.
Telegraph	2009	Project area	Active nest.
Little Blackfoot	2010	Planning area	Two active nests.
Ten Mile Creek*	2010	Project area	Two detections.
Brooklyn Bridge*	2011	Known territory	No detection.
Little Corral Gulch*	2011	Known territory	No detection. Prob. active nest; goshawk seen. An active nest was never located although there have been ample goshawk sightings over the years.
Little Blackfoot	2011	Known nests	Goshawks detected.

Location	Year Surveyed	Type of Survey	Results
South Fork Quartz Creek	2011	Known territory	No detection.
Sweeney Creek	2011	Known territory	No detection.
Upper Travis Creek	2011	Known territory	No detection.
Tenmile Creek*	2011	Project area	Goshawk detected.
Telegraph	2012	Project area, Old growth survey	No detections.
Tenmile Creek*	2012	Telegraph project within Combo area, old growth survey	One detection.
Telegraph	2013	Old growth survey	No detection.
Tenmile Creek*	2013	Old growth survey	No detection.
Tenmile Creek (TM NOGO Nest)*	2013	Project area	Nest located; adults did not return to nest.
Tenmile Creek*	2014	Project area	No detections.
Grizzly Gulch 3*	2014	Project area	Active nest; appear to have fledged (2) young.

Table 140. Goshawk nests that are known to occur within the Tenmile – South Helena project area.

Year Found	Nest Identification	Status in 2014
2013	Tenmile Creek Nest	Inactive
2005	Colorado Gulch Nest	Unknown
2014	Grizzly Gulch Nest	Active
2005	Mt. Helena Ridge Nest	Unknown

Goshawk activity has also been documented in the northeast corner of the project area since 1996, when a goshawk was seen and an active nest was suspected, but never found, in the Squaw Creek area in between Grizzly and Orofino Gulches. It's unknown whether this 1996 observation, and the 2005 Mt. Helena Ridge Nest, and the 2006 South Helena potential nest, and the 2014 Grizzly Gulch Nest represent one, or multiple, goshawk home ranges and territories (but the spacing of these territories would suggest different territories). There has also been a considerable amount of goshawk activity in the southeastern quarter of the project area: a goshawk was seen and a nest suspected near Brooklyn Bridge on the North Fork of Travis Creek in 1996, 1998, and 2004, but no goshawks were detected when checked in 2005 or 2011; and similarly, 4 to 5 miles farther south, a goshawk was seen and a nest suspected on Little Corral Gulch in 1996, 1998, 2004, but also no goshawks were detected when checked in 2005 or 2011. It should also be pointed out that there have also been observations of goshawks in the northwest quarter of the project area, in the lower reaches of Tenmile Creek, in Bear and Lazyman Gulches. As recently as 2011 an adult and juvenile goshawk were observed up Lazyman Gulch, which probably constitutes another goshawk home range and territory and probable nest area. These documented observations suggest that there may have been 4 other goshawk ranges/territories, in addition to the 4 known nests, which would

suggest that the project area could potentially contain at least 8 goshawk pairs and nesting territories.

It should be mentioned that the circular PFAs shown in Figure 81 (below) are idealized depictions using an approximately 420 acre-sized PFA from the guidelines of Reynolds et al. (1992). Actual PFAs are undoubtedly more irregularly shaped and somewhat malleable – shifting from year to year depending on vegetation condition, prey distribution, and the location of the nest site within the home range.

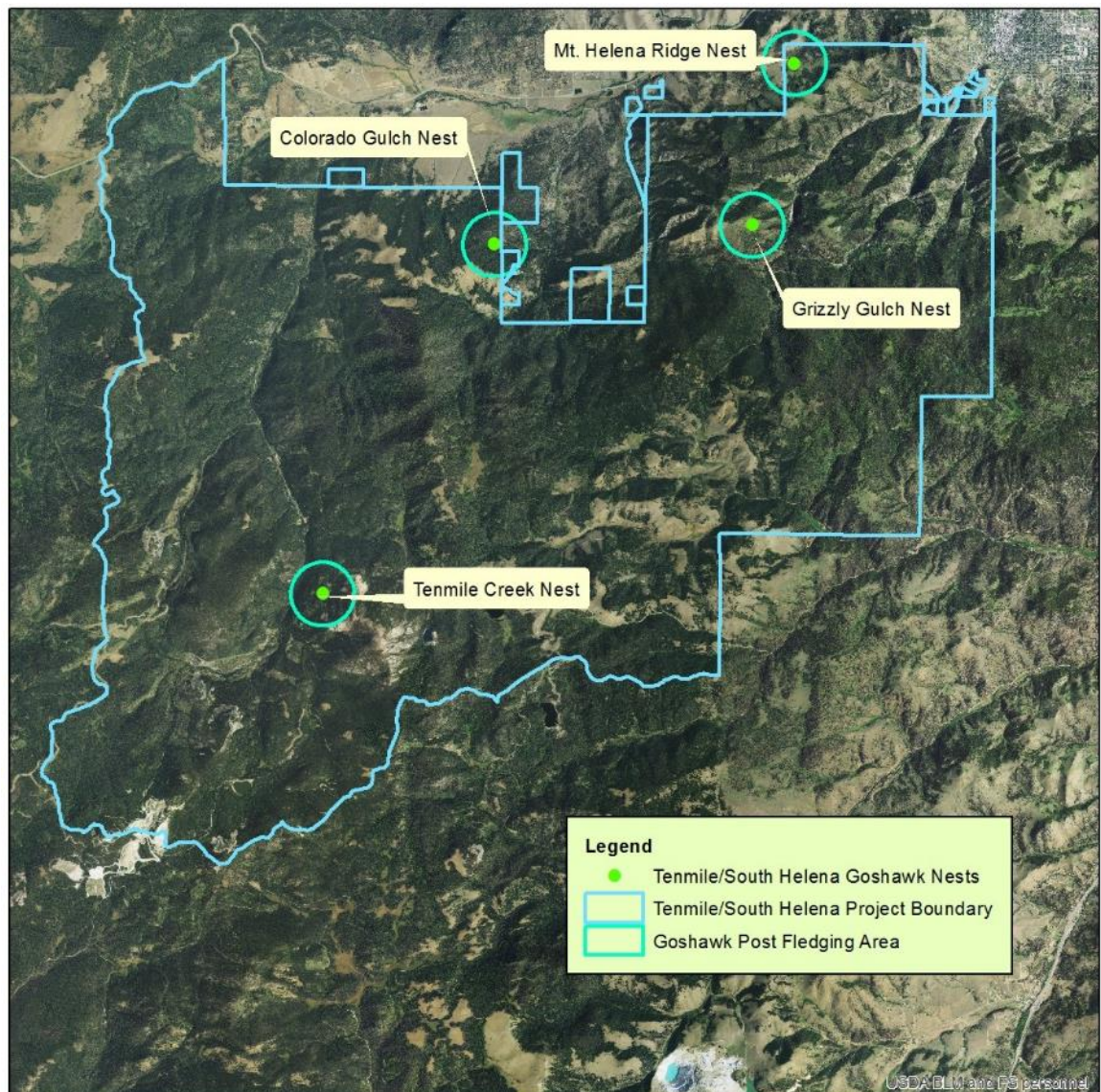


Figure 81. Map of known goshawk nests and PFAs in the Tenmile–South Helena project area, containing inholdings of private lands (not shown) and adjacent and abutting BLM lands.

Potential Population Density

Currently, there are two sets of guidelines available for determining how much nesting habitat might be needed by a pair of breeding goshawks in the Rocky Mountains of the western United States. Guidelines from Reynolds et al. (1992), for forests in the southwestern U.S., recommend that the size of nest areas be 30 acres and that nesting

habitat per pair of breeding goshawks contain 6 nest areas (3 suitable and 3 replacement) totaling 180 acres. Guidelines for the Forest Service's Northern Region (U.S.), from the Northern Goshawk Northern Region Overview: Key Findings and Project Considerations (USDA 2009b), recommend 40 acre nest areas with nesting habitat totaling 240 acres per goshawk pair. Modeling the habitat using 2014 VMap data – which is after the (2009) peak in MPB caused mortality to lodgepole and ponderosa pine – resulted in 24,313 acres of potential goshawk nesting habitat within the Tenmile – South Helena project area (which contains FS, BLM, city, and private lands) (Table 141. Acres of goshawk nesting and foraging habitat in the Tenmile – South Helena project area* based on 2014 R1-VMAP data., below). Of these acres, 22,734 acres are in patches of 30 acres or more, and 22,321 acres are in patches of 40 acres or more. This modeling exercise suggests, in the absence of territoriality, that there are nesting opportunities (habitat) for 126 goshawk pairs, based on Reynolds et al. (1992) southwestern guidelines, or for 93 goshawk pairs based on the Northern Region guidelines.

Knowing that goshawks are territorial with regard to nest sites and the surrounding and larger PFAs, and that the spacing between neighboring home ranges is approximately 3-4 miles (based on goshawk home ranges identified elsewhere in the adjacent Divide landscape), the above modeling, and resulting calculations, appear to (substantially and unrealistically) overestimate the potential goshawk density within the Tenmile – South Helena project area. However, when using both the Northern Region and Southwestern U.S. guidelines for home range sizes, of at least 5,000 and 5,820 acres respectively, which are more congruous with active nest sites being spaced 3-4 miles apart, it is mathematically more plausible that the project area could potentially support 10 to 12 goshawk ranges, even when assuming some overlap in home ranges. And based on goshawk observations in the project area since the mid-1990s – with today's existing habitat and suspected territorial spacing – 8 different goshawk territories is probably a more plausible estimate. The salient point from both calculations is that it appears that there is more than enough suitable nesting habitat in the project area – following the recent MPB caused mortality to lodgepole and ponderosa pine – to support, at the least, the 4 different nests (and probably different home ranges and different goshawk pairs) that have been known to occur across the project area since such records have been compiled.

In summary, prior to the mountain pine beetle outbreak (that peaked in 2009) and the subsequent loss of significant amounts of lodgepole and ponderosa pine, suitable goshawk habitat was widely available and frequently occupied across the Helena NF as well as the Tenmile – South Helena project area. At that point, no Forest-wide habitat thresholds with regard to minimum amounts of goshawk habitat had been breached and there were ample reasons to infer that goshawks and their habitat would continue to be maintained at the Forest level (see the Viability section). For instance:

- Goshawk habitat in R1 is abundant and well distributed where it occurs naturally. More forest cover and therefore nesting habitat, exists on today's landscape than what occurred historically (Samson 2005).
- There have been substantial increases in connectivity for forested habitat since Euro-American settlement (Samson 2005).

- The level of timber harvest of the forested landscape in R1 is insignificant (Samson 2005).
- The suppression of natural ecological processes has increased and continues to increase the amount of forested habitat (Samson 2005).
- Not a single known nest site in R1 is isolated from other known nests by more than the goshawks' estimated dispersal distance.
- Below a threshold of 20 to 30 percent of historical habitat, the effects of fragmentation (i.e. patch size and isolation) are suggested to have a negative impact on species persistence. No indication exists that forested ecosystems in R1 have reached the 20 to 30 percent threshold.
- Forested systems in R1 are more extensive and are less fragmented than in historical (~1800 A.D.) times from an increase in conifers into grasslands (Hessburg and Agee 2003; Gallant et al. 2003; Hessburg et al. 2004).
- The effects of habitat fragmentation on birds are less in the western United States compared to the Midwestern and eastern United States because western landscapes were naturally more fragmented in historical times.
- A comparison of habitat estimates for maintaining viable populations to that available on each Forest indicates that habitat is available in excess to that needed, given the distribution of the species and its habitat as mapped and according to the scientific literature (Samson 2006).

Thousands of acres of mature forest dominated by lodgepole and ponderosa pine have been defoliated by the mountain pine beetle infestation across the Helena NF landscape – some of it was potential goshawk habitat. Even before the loss of forest foliage a number of goshawks that we monitored changed nest sites each year, but generally remained within the same nest stand complex, typically nesting between a few hundred feet to a mile away from the previous year's nest site. With the loss of thousands of acres of nesting habitat, particularly in lodgepole pine and to a lesser degree in ponderosa pine, suitable nest stands have become more fragmented and smaller in size and number. Consequently, choices open to local goshawks have become more limited, particularly in terms of finding a new nest site close to the one used the year prior. Those goshawks that have been nesting in pine forest must now switch to viable green stands of Douglas-fir and, to a lesser extent, Engelmann spruce, subalpine fir, and, perhaps, aspen. This, in turn, is making it more difficult for fieldworkers to relocate goshawk pairs from year to year. At this point it is difficult to know whether the drop in goshawk survey numbers over the last few years reflects an actual decline in the local population or our inability to locate still-resident goshawks displaced to new locations. The actual effect of the mountain pine beetle outbreak on the HLCNF goshawk population will become evident as survey efforts continue to go forward over the next few years.

Habitat Analysis

Old Growth

In order to monitor the link between goshawks and old-growth forest, old-growth units across the Forest were surveyed for goshawks between 2007 and 2013. Additional goshawk survey efforts were focused in non-old-growth stands since goshawks utilize a

variety of mature forests, old growth or otherwise. The monitoring goal is to be able to respond to any unacceptable changes associated with management activities. In summary, monitoring efforts through 2013 indicated that goshawks continued to be well-distributed and to nest successfully across the Forest.

Old-growth on the Helena NF and within the project area has been discussed in detail in the Forest Vegetation Report. The Forest Plan directs that old-growth be assessed within 3rd order drainages, five of which are associated with the project area: Tenmile Creek (#1001-1), Minnehaha Creek (#1001-2), Walker Creek (#1001A), Buffalo Creek (#0814), and Nelson Gulch (#0909C). Two of the 3rd order drainages extend beyond the project area boundary: 1001A and 0809C. A minimum of 5 percent of 3rd order drainages is to be designated and managed as old-growth – either already established old-growth, or if established old-growth isn't available then stands that are developing into old-growth and called "Next-Best-Thing" (NBT). To make these designations, stands with inventory exams were selected where available, with the exception of mature lodgepole pine impacted by MPB. All stands were reviewed using aerial photography and past-activity layers. Additionally, in 2014, a sample of designated old growth stands had walk-through surveys conducted to assess if conditions had changed since old growth designation. Similar, additional surveys will be conducted in 2015.

Currently, on a larger scale, established old-growth occupies 8.2 percent of the Helena NF, 9.8 percent of the Divide Landscape, and 2.9 percent (1,406 acres) of the Tenmile – South Helena project area (from the R1 Summary Database Report). Relative to the 3rd order drainages within and overlapping the Tenmile – South Helena project area, pursuant to Forest Plan, the Forest Vegetation Report identifies the following: Tenmile Creek (#1001-1) currently has 1 percent designated as old growth; Minnehaha Creek (#1001-2) has 2 percent old growth; Walker Creek (#1001A) has 5 percent old growth; Buffalo Creek (#0814) 1 percent old growth; and Nelson Gulch (#0909C) has 0 percent old growth. Computer modeling has also identified an additional 480 acres of old growth that occur outside of the 3rd order drainages within the project area. These 480 acres, though not designated as old growth for Forest Plan purposes, are also important to wildlife, including goshawks, and will be field verified in the future.

Of all the old growth acres within the project area, 461 acres are potential goshawk nesting habitat and 608 acres are potential goshawk foraging habitat. Looking ahead, since the bulk of the old growth habitat is currently in non-pine stands, additional alterations to old growth habitat because of the mountain pine beetle infestation is not expected to be dramatic.

Analysis of Modeled Nesting and Foraging Habitat (Post Mountain Pine Beetle Epidemic)

Goshawk nesting and foraging habitat (which involves considerably more than just old-growth) is modeled according to Samson (2006) as described in the Criteria for Wildlife Models Helena National Forest (USDA 2009a) and according to vegetation diversity as described in Northern Goshawk Northern Region Overview: Key Findings and Project Considerations (USDA 2009b). R1-VMAP was used to depict and quantify the post-beetle nesting and foraging goshawk habitat in the Tenmile – South Helena project area.

As it turns out, goshawks located in the project area to this point have primarily been selecting, though not exclusively, Douglas-fir trees for nesting, prior to and after the pine beetle epidemic. Their selection for Douglas-fir aligns with the criteria used in the habitat model – so by identifying and mapping habitat we are more or less predicting species occurrence. This association with Douglas-fir as primary nesting habitat bodes well for goshawks given the extensive mortality of lodgepole and ponderosa pine forests in portions of the project area. Figure 82 and Figure 83 16 identify potential goshawk nesting and foraging habitat in the Tenmile – South Helena project area, today, following the mountain pine beetle outbreak that peaked in 2009.

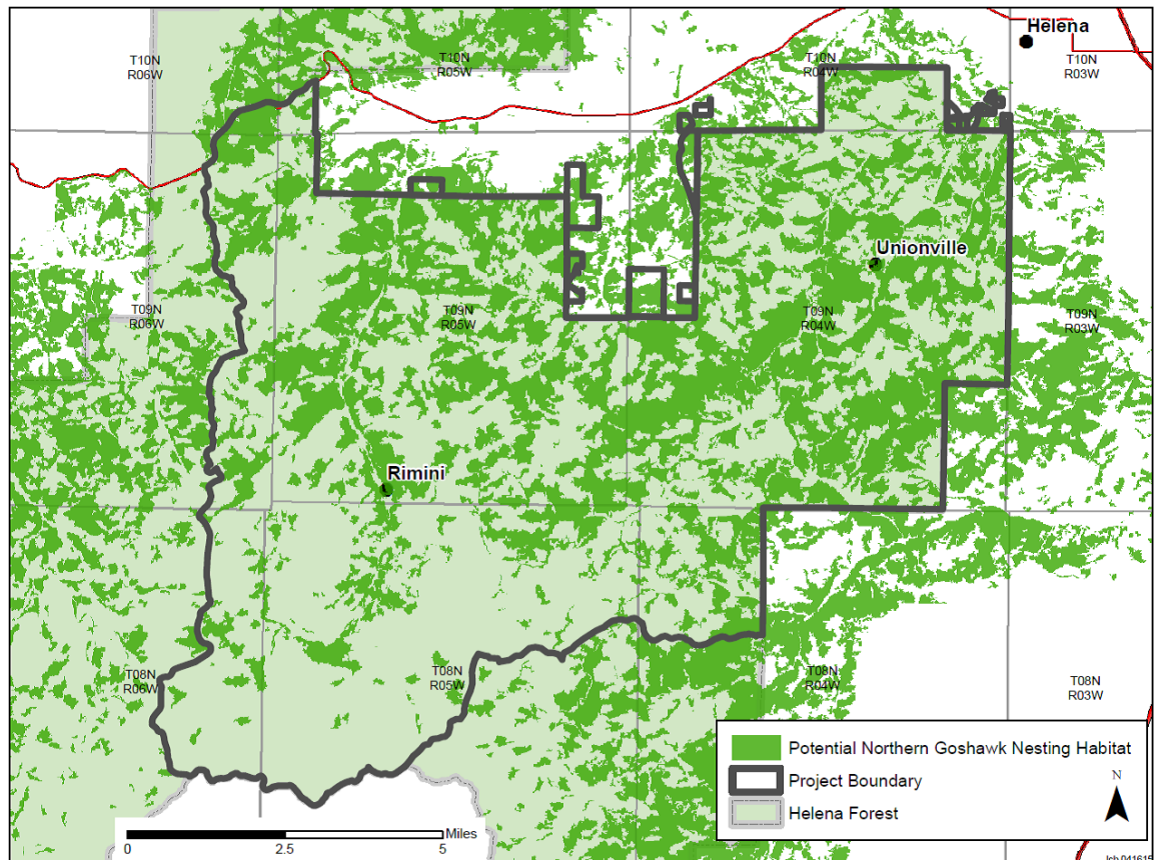


Figure 82. Potential goshawk nesting habitat in the Tenmile – South Helena project area, based on R1-VMap data.

As can be seen by comparing Figure 82 (above) and Figure 83 (below), potential nesting habitat, though widely distributed, is substantially more fragmented and less ubiquitous than foraging habitat. Following the MPB outbreak, nesting habitat, which is highly dependent on mature closed-canopied stands, was reduced, particularly in the western half of the project area where lodgepole pine had been the dominant conifer due to stand replacement wildfires prior to 1900. Foraging habitat, on the other hand, while also impacted by the MPB outbreak, but to a lesser degree, is still well-represented and remains viable even with a relatively more open canopy and a wider range of tree sizes.

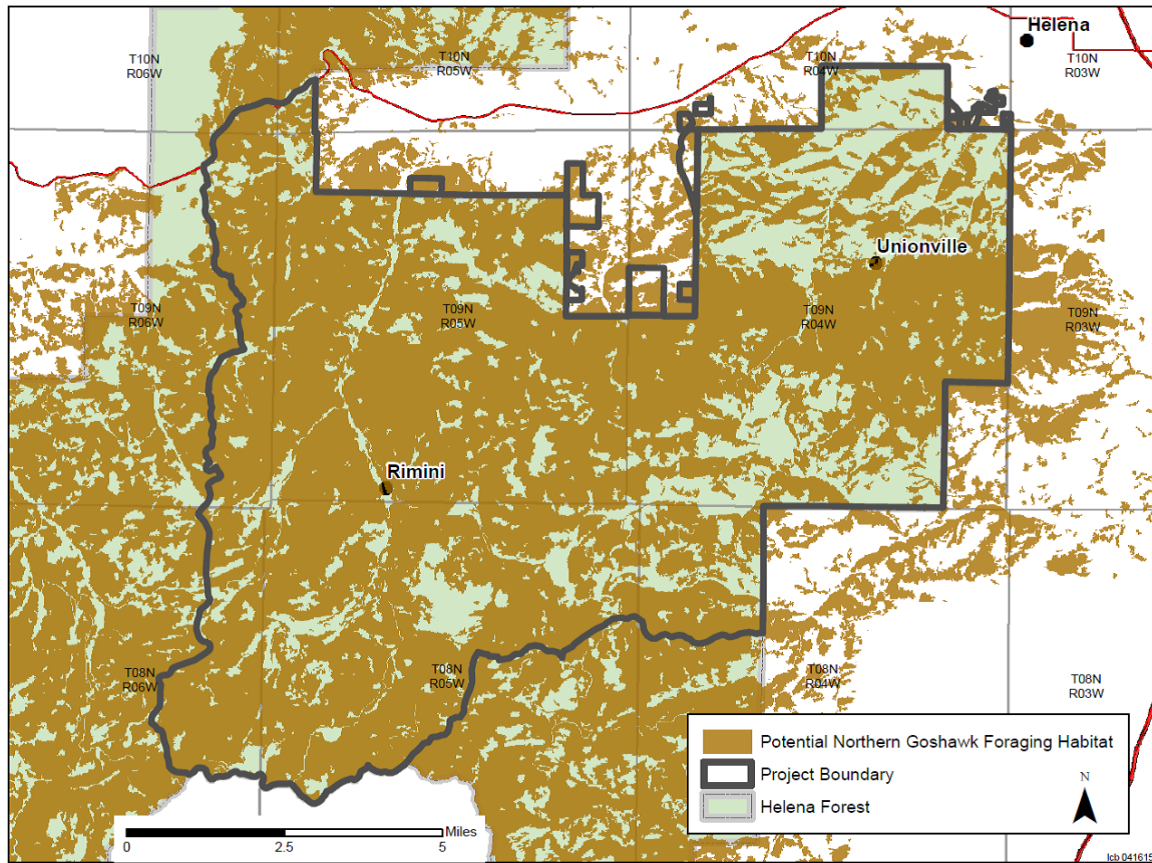


Figure 83. Potential goshawk foraging habitat in the Tenmile – South Helena project area, based on R1-VMAP data.

Table 141 below, summarizes the quantities of goshawk nesting and foraging habitat estimated for current, post-beetle, conditions in the Tenmile – South Helena project area. These data indicate that 40 percent and 75 percent of the project area is composed of nesting and foraging habitat, respectively.

Table 141. Acres of goshawk nesting and foraging habitat in the Tenmile – South Helena project area* based on 2014 R1-VMAP data.

Analysis Area	Nesting Habitat Acres**	Foraging Habitat Acres**
Tenmile – South Helena Project Area	24,313	46,008
* Project area is comprised of 81% USFS, 16% private, 2% BLM, and 1% city and other lands. ** 20,305 acres of nesting and 39,367 acres of foraging habitat are on USFS lands.		

Graham et al. (1999) recognized that insect and tree disease outbreaks could quickly result in the deterioration or loss of nesting habitat that up until that point had seemed secure and sufficient to support local goshawk populations. In the Tenmile – South Helena project area, the mountain pine beetle has successfully infested and swept through the forests due to the preponderance of mature, dense lodgepole-pine-dominated stands, particularly in the western half of the project area. For the most part this insect's damage has been done; it has progressed from the outbreak to epidemic phase, and will likely remain on the landscape in endemic quantities, but below pre-outbreak levels, until the

forest grows and in time the landscape once again contains susceptible mature lodgepole pine.

Other insects are also present within the project area, but in lesser amounts and with less dramatic effects. Western spruce budworm is present in a relatively small area in Corral Gulch in the southeastern quarter of the project area, and in lesser amounts scattered across the project area. Western spruce budworm is a defoliator that is affecting mainly Douglas-fir, but primarily south of the project area in the Flume Chessman area. Another defoliator is the Douglas-fir beetle, which has only been mapped at endemic levels in the project area. Both defoliators have the potential to increase in populations in overstocked, multi-layered, stressed, Douglas-fir stands.

As discussed earlier, of the 24,313 acres of potential nesting habitat in the Tennmile – South Helena project area, 22,734 acres are in patches of 30 acres or more and 22,321 acres are in patches of 40 acres or more. This amount of nesting habitat (divided by 6 nest sites [180–240 acres of nesting habitat] per goshawk pair) could theoretically accommodate 93 to 126 goshawk pairs, based on guidelines for the Northern Region (Brewer et al., 2009) and southwestern U.S. (Reynolds et al., 1992), respectively. However, factoring in territorial spacing based on home range sizes of 5,000 and 5,820 acres from those same respective guidelines, then the project area (61,395 acres) would still contain enough suitable habitat to potentially support 10 to 12 goshawk pairs – although the birds would have a considerably smaller array of nest stands to choose from than prior to the mountain pine beetle, western spruce budworm, and Douglas-fir beetle infestations.

Regional Overview Habitat Analyses

Characteristics of the Tennmile – South Helena project area as goshawk nesting and foraging habitat, as well as the post fledging area (PFA) habitat, is also evaluated based on vegetation diversity matrices described in the guidelines identified in the Northern Goshawk Northern Region Overview: Key Findings and Project Considerations (Brewer et al. 2009).

Home Range/Foraging Area Analysis

The vegetation composition for this analysis was based on 2014 R1-VMAP data. Table 142 summarizes the composition of dominant vegetation recommended for goshawk home ranges in the southwestern U.S. (Reynolds et al. 1992), compared with that found in occupied goshawk home ranges (N = 19) in the Flint Creek Range of west-central Montana (Clough 2000), and compared to home range habitat in the Tennmile – South Helena project area. In other words, the project area's home range (foraging area) vegetation/habitat diversity matrix is compared to the diversity matrices for Montana and the southwestern U.S., to determine if the project area's vegetation data are comparable to, or fall within, the range of the two.

Currently, the Management Recommendations for the Northern Goshawk in the Southwestern United States (Reynolds et al. 1992) represent the only comprehensive guidelines, based on rigorous research, that detail optimal vegetation composition and structure for goshawks on their home ranges. Although forest composition in the southwestern U.S. (in this case, the Kaibab Plateau region of Arizona) differs somewhat

from that of central Montana, the basic characteristics are similar enough that a comparison of goshawk habitat in the two areas is a valid exercise.

Table 142. Vegetation composition (Habitat Diversity Matrix) of foraging habitat in goshawk home ranges in the Tenmile – South Helena project area (based on R1-VMAP estimates) compared with ranges in west central Montana (Clough 2000) and recommendations for ranges in the southwestern U.S. (Reynolds et al. 1992).

Stand Size Class and Canopy Cover	Recommendations for Home Ranges in the Southwest U.S. (Reynolds et al. 1992)	Existing Condition on Home Ranges in West-Central Montana (Clough 2000)	Existing Conditions of Home Ranges in the Tenmile – South Helena Project Area
Grass/Forb/Shrub	10%	7%	10% (6,180 ac)
Seedling/Sapling (<5 inch dbh)	10%	9%	1% (763 ac)
Small Poles (5-10 inch dbh)	20%*	65%	39% (24,037 ac)
Large Poles (Mature) (>10 inch dbh)	60%*	11%	46% (28,462 ac)
> 5.0 inch dbh with >50% canopy cover	60% (>12 inch dbh)	69%	76% (46,576 ac)**
*Reynolds' small poles are 5-12 inches dbh, large poles >12 inches dbh [dbh = diameter at breast height].			
**Canopy cover (>40%) and pole dbh (> 5.0 inches) are based on categories associated with the R1-VMAP dataset.			

As can be seen in Table 142, the percentages of grass/forb/shrub habitats within goshawk ranges of the v Helena project area are similar to what was found in the active ranges in west-central Montana, and equivalent to what is recommended in the Southwestern U.S. guidelines. The early-successional (seedling/sapling) vegetation of west-central Montana and the southwestern U.S. guidelines are also of relatively similar proportions, but the project area is comprised of considerably less. Relative to the composition of mid-successional (small poles) and late-successional (large poles, mature) vegetation, the project area is in between the west-central Montana and southwestern U.S. guidelines, but a little more in line with the southwestern U.S. guidelines. Relative to forests composed of trees greater than 5 inch dbh with 50 percent or more canopy closure, the project area is similar to the west-central Montana and southwestern U.S. guidelines, particularly considering that the project area's 76 percent value is based on 40 percent, or greater, canopy closure (a category in VMAP) instead of the 50 percent or greater value. So, the Tenmile – South Helena project area (with the exception of seedling/sapling sized trees) appears to be providing habitat that is within the range of what goshawks perceive as suitable, even after the mountain pine beetle epidemic and the subsequent loss of sizeable acreages of lodgepole pine, which is probably attributed to their strong reliance on other trees, such as Douglas-fir.

PFA Analysis

Post-fledging areas (PFAs) require an ample representation of pole and mature forest with relatively high canopy closure in order to provide a protected environment for young newly fledged birds. Given that PFAs often cover several hundred acres and need to

provide habitat for diverse prey, as well as cover, most PFAs are fairly heterogeneous environments. There is considerable variation in their composition within a given Forest, a geographic region, and, in particular, between regions. For instance, 66 percent of the PFAs found in west central Montana were found to be composed of trees ≥ 5 inches dbh and $>50\%$ canopy cover (Clough 2000); this was true for only 36 percent of the PFAs in eastern Oregon (Desimone 1997 as cited in USDA 2009c; McGrath et al. 2003). In areas where site conditions, such as moist north slopes, can support higher levels of canopy closure, such as in the Northern Rocky Mountain Ecological Province, Samson's (2005) habitat model specifies canopy coverage of greater than 70%. In drier areas, such as the Middle and Southern Rocky Mountain Ecological Provinces, the same habitat model specifies less canopy coverage (greater than 50 percent vs. greater than 70 percent).

Table 143 through Table 146 summarize the vegetation composition of PFAs surrounding the 4 known nests within the Tennile – South Helena project area and provide a comparison of those data with that of PFAs in west-central Montana (Clough, 2000, excerpted from the Northern Goshawk Northern Region Overview: Key Findings and Project Considerations USDA 2009b), and with the PFA recommendations of Reynolds et al. (1992) for the southwestern U.S.

Table 143. Vegetation composition (Habitat Diversity Matrix) of the Tennile Creek Nest post-fledging area (PFA) within the Tennile – South Helena project area (based on R1-VMAP estimates) compared with ranges in west central Montana (Clough 2000) and recommendations for ranges in the southwestern U.S. (Reynolds et al. 1992).

Stand Size Class and Canopy Cover	Recommendations for Home Ranges in the Southwest U.S. (Reynolds et al. 1992)	Existing Condition on Home Ranges in West-Central Montana (Clough 2000)	Existing Condition of the Tennile Creek Nest PFA within the Project Area
Grass/Forb/Shrub	10%	7%	1% (3 ac)
Seedling/Sapling (<5 inch dbh)	10%	9%	0% (0 ac)
Small Poles (5-10 inch dbh)	20%*	66%	49% (203 ac)
Large Poles (Mature) (>10 inch dbh)	60%*	11%	36% (148 ac)
> 5.0 inch dbh with >50% canopy cover	60% (>12 inch dbh)	69%	79% (329 ac)**
*Reynolds' small poles are 5-12 inches dbh, large poles >12 inches dbh [dbh = diameter at breast height].			
**Canopy cover (>40%) and pole dbh (> 5.0 inches) are based on categories in the R1-VMAP dataset.			

Table 144. Vegetation composition (Habitat Diversity Matrix) of the Colorado Gulch Nest post-fledging area (PFA) within the Tenmile – South Helena project area (based on R1-VMAP estimates) compared with ranges in west central Montana (Clough 2000) and recommendations for ranges in the southwestern U.S. (Reynolds et al. 1992).

Stand Size Class and Canopy Cover	Recommendations for Home Ranges in the Southwest U.S. (Reynolds <i>et al.</i> 1992)	Existing Condition on Home Ranges in West-Central Montana (Clough 2000)	Existing Condition of the Colorado Gulch Nest PFA within the Project Area
Grass/Forb/Shrub	10%	7%	4% (17 ac)
Seedling/Sapling (<5 inch dbh)	10%	9%	0% (0 ac)
Small Poles (5-10 inch dbh)	20%*	66%	15% (61 ac)
Large Poles (Mature) (>10 inch dbh)	60%*	11%	81% (337 ac)
> 5.0 inch dbh with >50% canopy cover	60% (>12 inch dbh)	69%	76% (316 ac)**

*Reynolds' small poles are 5-12 inches dbh, large poles >12 inches dbh [dbh = diameter at breast height].
 **Canopy cover (>40%) and pole dbh (> 5.0 inches) are based on categories in the R1-VMAP dataset.

Table 145. Vegetation composition (Habitat Diversity Matrix) of the Grizzly Gulch Nest post-fledging area (PFA) within the Tenmile – South Helena project area (based on R1-VMAP estimates) compared with ranges in west central Montana (Clough 2000) and recommendations for ranges in the southwestern U.S. (Reynolds et al. 1992).

Stand Size Class and Canopy Cover	Recommendations for Home Ranges in the Southwest U.S. (Reynolds <i>et al.</i> 1992)	Existing Condition on Home Ranges in West-Central Montana (Clough 2000)	Existing Condition of the Grizzly Gulch Nest PFA within the Project Area
Grass/Forb/Shrub	10%	7%	35% (145 ac)
Seedling/Sapling (<5 inch dbh)	10%	9%	0% (0 ac)
Small Poles (5-10 inch dbh)	20%*	66%	12% (51 ac)
Large Poles (Mature) (>10 inch dbh)	60%*	11%	53% (219 ac)
> 5.0 inch dbh with >50% canopy cover	60% (>12 inch dbh)	69%	37% (152 ac)**

*Reynolds' small poles are 5-12 inches dbh, large poles >12 inches dbh [dbh = diameter at breast height].
 **Canopy cover (>40%) and pole dbh (> 5.0 inches) are based on categories in the R1-VMAP dataset.

Table 146. Vegetation composition (Habitat Diversity Matrix) of the Mt. Helena Ridge Nest post-fledging area (PFA) within the Tenmile – South Helena project area (based on R1-VMAP estimates) compared with ranges in west central Montana (Clough 2000) and recommendations for ranges in the southwestern U.S. (Reynolds et al. 1992).

Stand Size Class and Canopy Cover	Recommendations for Home Ranges in the Southwest U.S. (Reynolds et al. 1992)	Existing Condition on Home Ranges in West-Central Montana (Clough 2000)	Existing Condition of the Mt. Helena Ridge Nest PFA within the Project Area
Grass/Forb/Shrub	10%	7%	43% (177 ac)
Seedling/Sapling (<5 inch dbh)	10%	9%	0% (0 ac)
Small Poles (5-10 inch dbh)	20%*	66%	8% (35 ac)
Large Poles (Mature) (>10 inch dbh)	60%*	11%	49% (203 ac)
> 5.0 inch dbh with >50% canopy cover	60% (>12 inch dbh)	69%	37% (154 ac)**

*Reynolds' small poles are 5-12 inches dbh, large poles >12 inches dbh [dbh = diameter at breast height].
 **Canopy cover (>40%) and pole dbh (> 5.0 inches) are based on categories in the R1-VMAP dataset.

The existing condition of the 4 PFAs within the project area do not necessarily align with either Clough's (2000) observations from west-central Montana or Reynolds et al. (1992) recommendations for the southwest U.S. The PFAs also don't align with each other; this is to be expected between the PFAs in the cooler, moist environs (Colorado Gulch and Tenmile Creek) compared with those in the drier forests (Mt. Helena Ridge and Grizzly Gulch). However, even within similar forested conditions, the PFAs differ in their vegetative composition. This may be indicative of the wide ecological amplitude goshawks demonstrate in nest site selection, or it may be that the MPB outbreak is forcing goshawks to nest in atypical habitat. It is also possible that the current vegetative conditions upon which the diversity analysis is based are different enough today than they were ten years ago when two of the four nests were active, thereby masking any patterns in habitat selection. Keep in mind that data are limited with regards to the occupancy status of these PFAs over time. It's also possible that each known nest and PFA was occupied only once in the past 10 years.

Colorado Gulch and the Mt. Helena Ridge nests were occupied at the onset of the mountain pine beetle infestation (2005) and thus prior to major changes in pine vegetation, while the Tenmile Creek and Grizzly Gulch nests were occupied after the pine beetle infestation and associated vegetation changes (2013 and 2014 respectively). Consequently, it's unknown whether the nest sites and PFAs that these goshawk pairs selected were representative of what they typically selected over consecutive years, or if there are indeed differences in nest site selection pre- and post- mountain pine beetle outbreak. And confounding the situation further is also the fact that when comparing the current vegetative conditions of the 2 PFAs known to occur prior to the pine beetle infestation, to each other, or when comparing the current vegetative conditions of the 2 PFAs that were found after the pine beetle infestation to each other – they are quite different.

For instance, for the two nests (PFAs) found prior to the pine beetle infestation, only 4 percent of the Colorado Gulch PFA is currently composed of Grass/Forb/Shrub, compared with 43 percent of the Mt. Helena Ridge PFA. Inversely, the Colorado Gulch PFA (which has less Grass/Forb/Shrub) contains more acres (398 acres) of small (15 percent) and large mature (81 percent) poles, and more 5 inch dbh trees with greater than 40 percent canopy coverage (316 acres or 76 percent), compared to the Mt. Helena Ridge PFA that contains less acres (238 acres) of small (8 percent) and large mature poles (49 percent), and less 5 inch trees with greater than 40 percent canopy closure (154 acres or 37 percent).

A similar relationship is apparent for the two nests (PFAs) found after the pine beetle infestation. The Tennmile Creek PFA has less Grass/Forb/Shrub (1 percent) than does the Grizzly Gulch PFA, which contains 35 percent Grass/Forb/Shrub. But the Tennmile Creek PFA also has more acres (351 acres) of small (49 percent) and large mature (36 percent) poles, and more canopy closure (329 acres or 79 percent), than the Grizzly Gulch PFA that contains 270 acres of small (12 percent) and large mature (53 percent) poles, with less canopy closure (152 acres or 37 percent). Noteworthy is that none of the 4 PFAs, today, contain seedling/sapling sized trees.

The current condition of the vegetation for the two PFAs that were known to exist before the pine beetle infestation also differ in their alignment with the vegetative conditions from west-central Montana (Clough 2000) and the Reynolds et al. (1992) recommendations. The Colorado Gulch PFA is in-between Clough and Reynolds et al. with regard to amount of Grass/Forb/Shrub within the PFA, but the Mt. Helena Ridge PFA has significantly more than Clough or Reynolds et al. The Colorado Gulch PFA has less small pole sized trees than either Clough or Reynolds et al., but more large mature poles than either, but relatively in line with the two regarding canopy closure. Mt. Helena Ridge has less small poles, and is in between for large mature poles relative to Clough and Reynolds et al., but below both regarding canopy closure.

The current existing condition of vegetation from the two PFAs that were found after the pine beetle infestation also differ in their alignment with the vegetative conditions from west-central Montana (Clough 2000) and the Reynolds et al. (1992) recommendations. The Tennmile Creek PFA has less Grass/Forb/Shrub within the PFA than found or recommended by Clough or Reynolds et al., while the Grizzly Gulch PFA has significantly more. The Tennmile Creek PFA was also in-between the 2 benchmarks for small and large pole sizes, and slightly above either with regard to canopy closure. Grizzly Gulch was below Clough or Reynolds et al. with regard to small poles, in the middle range with regard to large poles, and below both regarding canopy closure.

Without consecutive years of data for these four known nests, PFAs, and territories it's not known how (or if) these goshawk pairs actually adapted to the changing environment. Did they adjust their nest sites and PFAs within their territories, or did they adjust the size and shape and location of their territories? And whether or not some adjustments in their use of habitat were made, did they successfully produce offspring? The answers to these questions are currently unknown, but should be answered with additional monitoring going forward. One thing is apparent; the goshawk pairs utilized PFAs that

were quite different in their vegetative condition and composition, which is probably indicative of their wide range of ecological amplitude and adaptability.

Environmental Consequences

Effects to Northern Goshawk are evaluated according to the following measures:

- Acres of foraging and nest habitat treated in the project area
- Home range/foraging area diversity matrix post-treatment percentages in the project area
- PFA diversity matrix post-treatment percentages

Desirable Northern Goshawk Habitat Conditions

- ✓ Between 180 and 240 acres nesting habitat per 5,000 to 5,820 acre territory
- ✓ Heterogeneous foraging habitat including mature forest as well as a mix of other forest and non-forest components
- ✓ Approximately 420 acres post fledgling habitat that includes some mid to late-seral forests with structural diversity in the understory

Effects Common to All Alternatives

Untreated portions of the project area will continue to progress through natural plant succession processes, regardless of alternative. Disturbance processes, such as climate change, insect and disease, and fire, will continue to influence the project area.

Effects Common to All Action Alternatives

Samson (2005) summarized recent (2000 and newer) studies on the effects of vegetation treatments on northern goshawks that show, among others, that: (1) the majority of goshawk pairs move from nest stands when stand structure is modified by more than 30 percent (Penteriani and Faivre 2001, p. 213); (2) human disturbance is not a factor if 70 percent of the nest stand structure is maintained and timber management operations are time restricted during the nesting period (McGrath et al. 2003 as cited in Samson 2005, p. 37); this is accomplished via a 'no activity' buffer around the nest sites until the nest is no longer occupied and a timing restriction in the post-fledgling area from 15 April through 15 August to protect goshawk pair and young from disturbance; (3) timber harvest has no effect on goshawk breeding area occupancy, nest success, or productivity 1 to 2 years after treatment (Moser and Garton 2004 as cited in Samson 2005, p. 36); and (4) no difference in the productivity of northern goshawks occurs in logged versus unlogged areas (Penteriani and Faivre 2001, p. 213).

Disturbance thresholds identified in numbers (1) and (2) above will be addressed through application of 'no treatment zones' in areas surrounding active nest sites. This will be achieved by restricting any treatments in any stand that provides nesting habitat for active nests identified through field validation prior to or during project implementation. The size and configuration of this zone would depend on the location of the nest, the distribution of green overstory trees, and other local factors to be assessed by the wildlife biologist at the site. If possible, the buffer around an active nest tree should be at least 40 acres. In addition, no ground disturbing activities will occur within the PFA from mid-April through August 15 to ensure that the goshawk family is adequately protected during the courtship, egg-laying, incubation, early nestling, and late fledgling periods at any active nest site.

Activity timing recommendations vary among researchers. Reynolds et al. (1992 at p. 24, southwestern U.S.) recommend “no adverse management activities in the PFA during the nesting season, March 1 – September 30.” Penteriani and Faivre (2001, Eastern Europe) recommend restricting activities from February to August. Others have suggested restricting timber management operations to avoid activity during the breeding through fledging time periods (McGrath et al. 2003, eastern Oregon). Fledging dates can vary by geographic area, elevation, or spring weather. In western Montana, Clough (2000) found a random sample of breeding goshawks began incubating eggs on May 5 (+/- 1.42 days 90% CI); hatched June 6 (+/-1.42 days); and fledged July 12 (+/-1.42 days). On average then, goshawks in Clough’s study were likely capable of sustained flight by August 10 (+/-1.42 days), 65 days-post hatching. In northern Idaho (R1), Moser and Garton (2009) experimentally tested the impacts of clearcutting the nest area on goshawk re-occupancy rates and productivity and found that re-occupancy of the nest area was not impacted 1 to 2 years postharvest provided harvest activities occurred after August 15th and adequate nesting habitat remained in the PFA post-treatment. Given the above, localized data may be used to substantiate entry into the PFA prior to September 30. Past data collected at active goshawk nest sites on the Forest indicate that goshawks often fledge by August 15th. Regardless, site-specific data will continue to be used and if needed timing restrictions will be designed to reflect variations in fledging dates.

Goshawks occur in forests that evolved under a diversity of fire regimes including mixed-severity and stand-replacing events. Reynolds et al. (1992) and Graham et al. (1999) have suggested that the use of controlled fire and thinning may improve habitat for goshawks by creating favorable conditions for goshawks and their prey. Common effects of prescribed fire in the project area include: promoting diameter growth in overstory trees, creating open understories, and maintaining down woody debris favorable for goshawk prey species.

None of the action alternatives will treat stands that meet old growth characteristics as described in Green et al. (1992) and summarized in the Forest Vegetation Report. Therefore, there are (and will be) no impacts to goshawk habitat from the treatment of old growth in the project area. Stands that currently do not meet old growth criteria but that have been identified as areas to manage for old growth should eventually give rise to goshawk habitat as long as conditions are sufficient to promote large tree growth with a diverse understory. There will be no further discussions on old growth.

Alternative 1

Direct/Indirect Effects

There are no direct effects associated with Alternative 1. Some components of northern goshawk habitat would most likely decrease under this alternative, particularly in Douglas-fir stands that currently provide the majority of goshawk habitat in the project area. Many of these stands are surrounded by lodgepole and ponderosa pine, many of which are dead, killed by mountain pine beetles. Some of these stands are highly susceptible to stand replacement fire as evidenced by the MacDonald Pass Fire of 2009. This fire resulted in high levels of stand replacement with a majority of the overstory trees killed by fire. The MacDonald Pass Fire contained stand characteristics similar to the project area – large areas of homogenous stands of lodgepole pine. However, in the

short term (up to 10 years), all old forest habitat composed of Douglas-fir dominated stands would continue to be available in a variety of connected patch sizes.

Lodgepole and ponderosa pine stands that may have provided some goshawk habitat in the past will no longer provide as much nesting habitat, yet some foraging habitat should be provided in many of the dead and dying stands. However, based upon Squires and Ruggiero (1996) goshawks are adept at finding suitable microsites within stands that otherwise do not appear to be suitable nesting habitat. This is further substantiated in McGrath et al. (2003). One of the findings from McGrath et al. (2003) is that many of their sampled goshawks were nesting in non-typical habitat to the extent that McGrath was unable to differentiate between actual nests and random locations in a “blind sample comparison.” Despite the fact that lodgepole and ponderosa pine stands may no longer provide ‘typical’ nesting habitat, goshawks will most likely continue to take advantage of any suitable, available microsites in the project area for nesting.

The project area should continue to provide adequate foraging habitat. Red squirrel densities, however, may be declining due to reduced cone crops in mountain pine beetle killed stands, and red squirrels are a primary prey item for goshawks.

No Action Alternative Cumulative Effects

While there can be no cumulative effect from no action being taken, a discussion of the likely trajectory of goshawk habitat may prove beneficial. Alternative 1 maintains the status quo with regards to landscape level effects on goshawks. Mountain pine beetle related mortality is resulting in areas of early seral forests similar to those created by wildfire; furthermore, the dead trees, once they fall, would add to the down woody debris created by those wildfires.

Alternatives 2 and 3

Direct/Indirect Effects

Nesting Habitat Analysis

Effects to goshawk habitat associated with alternatives 2 and 3 are summarized in Table 147. Alternatives 2 and 3 would result in the regeneration of 925 and 496 acres of nesting habitat, respectively. While these acres will no longer provide nesting habitat they may provide a diversity of foraging opportunities. Intermediate harvest is proposed on approximately 2,626 and 1,999 acres of nesting habitat in alternatives 2 and 3, respectively. These intermediate harvest treatments are designed to retain some key components of goshawk nesting habitat - i.e. large trees, large snags, and at least 20 percent canopy cover. However, because canopy reductions can result in increased solar radiation and heat stress as well as increased visibility to predators (USDI FWS 1998), these areas are not expected to provide nesting habitat post-treatment. Prescribed fire treatments are proposed on 7,484 acres of nesting habitat in alternative 2 and 5,812 acres in alternative 3. Of those acres, mixed-severity prescribed fire treatments are assumed to remove nesting habitat characteristics. However, the prescribed fire treatments should open up the understory and create down woody debris habitat for goshawk prey.

Table 147. Acres of potential goshawk habitat treated by treatment-type for alternatives 2 and 3 (based on R1-VMAP)*.

Alternative	Regeneration Harvest		Intermediate Harvest		Pre-commercial Thin		Prescribed Fire ¹ (Mixed-Severity)	
	Nest Habitat	Forage Habitat	Nest Habitat	Forage Habitat	Nest Habitat	Forage Habitat	Nest Habitat	Forage Habitat
Alternative 2	925	3,920	2,626	3,581	160	386	7,484 (868)	10,741 (1,554)
Alternative 3	496	2,282	1,999	2,797	159	360	5,812 (277)	7,456 (633)
* Total acres of nesting and foraging habitats are not calculated since acres are not additive – i.e. some acres in the project area provide BOTH nesting and foraging habitat.								

There are currently 24,313 acres of nesting habitat in the project area. Upon implementation of either alternative 2 or 3, 19,894 acres will remain in alternative 2 and 21,541 acres in alternative 3 assuming that regeneration and intermediate harvest as well as mixed-severity prescribed fire treatments remove nesting habitat (precommercial thinning is not expected to remove nesting or foraging habitat such that treated areas would no longer provide nesting or foraging habitat). Of these acres, there are 16,594 acres in patches of 40 acres or more in alternative 2 and 18,425 acres in patches of 40 acres or more in alternative 3. The project area comprises about 10-12 home ranges; therefore the project area should consist of at least 2,400 acres of nesting habitat post-treatment with patch sizes of 40 acres or more according to USDA (2009c) [This is based on 240 acres per 5000 acres]. The acres remaining post-treatment in alternative 2 (16,594 acres) or Alternative 3 (18,425 acres) exceed these guidelines.

Other portions of the Project area that are proposed for treatment may experience an increase in habitat for goshawk competitors such as red-tailed hawks and great horned owls. Treatments that favor the creation of early successional habitat are beneficial to these species (Woodbridge and Detrich 1994).

Home Range/Foraging Habitat Analysis

Goshawks' use of their overall home range during the nesting season is poorly understood (Squires and Kennedy 2006). Some studies have suggested that goshawks also need a narrow range of habitat conditions in the foraging area, similar to those found in the nest area (Beier and Drennan 1997; Finn et al. 2002; Greenwald et al. 2005). However, a larger number of studies have reported that goshawks use a broad range of habitat conditions in the foraging area (Reynolds et al. 1992; Bright-Smith and Mannan 1994; Hargis et al. 1994; Beier and Drennan 1997; and Northern Goshawk, page 13, summarized in Squires and Kennedy 2006), which reflects their opportunistic, generalist diet.

Abundance and availability of prey are important considerations in determining impacts of management activities on goshawks. Squires and Ruggiero (1996) suggested that prey abundance influences goshawk productivity and home range occupancy. Food limitations may also result in adult starvation. The availability of food items is therefore important; a high abundance of a particular food item may not benefit goshawks if they are unable to fly to, or hunt, their prey due to dense forest conditions.

A summary by the USDI FWS (1998) and Reynolds et al. (1992) listed several prey species that are of particular importance to the goshawk throughout its range. Of those, the following are found in the project area: chipmunks, cottontail rabbits, snowshoe hares, Douglas squirrels, red squirrels, American robins, Steller's jays, ruffed and blue grouse, common crows, and northern flickers.

Reynolds et al. (1992) recommended that goshawk foraging areas should include a variety of habitats and ages to support an abundant prey base. Although the species on which goshawks prey vary among forest types, there are a few habitat features that appear to be important to a variety of prey species (Reynolds et al. 1992, USDI FWS 1998). These features include snags, downed logs, large trees (> 18 inches in diameter), openings and associated herbaceous and shrubby vegetation, interspersed vegetation (the degree of intermixing of vegetation structural stages), and canopy cover. Reynolds et al. (1992) also recommended that forest areas managed for goshawk prey species include large trees scattered throughout the foraging area in order to provide hiding, feeding, denning, and nesting areas for selected goshawk prey species (USDI FWS 1998). For example, red squirrels select closed mature forests and tend to avoid areas of high interspersed vegetation. Grouse, on the other hand, respond positively to high interspersed vegetation and older forests. Other prey species, such as American robins, are habitat generalists and are abundant in most structural stages (Reynolds et al. 1992).

Approximately 3,920 acres of foraging habitat would be regenerated in Alternative 2 and 2,282 acres in alternative 3. Intermediate harvest is proposed on 3,581 acres in alternative 2 and 2,797 acres in alternative 3. Prescribed fire would be applied to 10,741 acres of foraging habitat in alternative 2 and 7,456 acres in alternative 3. Regeneration harvest treatments would open up stands and remove understory vegetation while retaining some large trees depending on the type of regeneration harvest. For example, shelterwood treatments would retain between 40 and 75 trees per acre with an average diameter of 10 inches while seed tree cuts would retain between 20 and 50 trees per acre with an average diameter of 9 inches. These types of treatments tend to benefit habitat generalists like robins and flickers both of which are important goshawk prey items. Intermediate harvest treatments would retain large trees where they are available and promote open understories and a subsequent increase in shrub and herbaceous vegetation depending on site conditions. Intermediate harvest treatments would benefit habitat generalists as well as those species associated with openings and herbaceous and shrub understories such as grouse. Prescribed fire will also promote an open understory and may also kill some overstory trees. Both prescribed fire and thinning may improve foraging habitat for goshawks by opening up dense understory vegetation, creating snags, downed logs, woody debris, and other conditions that may benefit goshawk prey species (Reynolds et al. 1992, Graham et al. 1999).

Changes in the vegetation diversity within the project area are also analyzed to reflect the importance of retaining a broad range of habitat conditions for goshawk foraging habitat (USDA 2009b). Table 148 summarizes changes in vegetation caused by implementation of the action alternatives' treatments, and how the resulting habitat diversity matrix compares with recommendations developed by Reynolds et al. (1992) for the southwestern U.S. and habitat conditions documented by Clough (2000) in west-central Montana.

Table 148. Goshawk home range vegetation composition (Habitat Diversity Matrix) within the project area per action alternative (based on R1-VMAP estimates) compared with home ranges in west-central Montana (Clough 2000) and recommendations for home ranges in the southwestern U.S. (Reynolds et al. 1992).

Stand Size Class and Canopy Cover	Recommendations for Home Ranges in the Southwest U.S. (Reynolds et al. 1992)	Existing Condition Home Ranges in West-Central Montana (Clough 2000)	Alternative 1	Alternative 2	Alternative 3
Grass/Forb/Shrub	10%	7%	6,180 ac (10%)	6,180 ac (10%)	6,180 ac (10%)
Seedling/Sapling (<5 inch dbh)	10%	9%	763 ac (1%)	4,796 ac (8%)	3,072 ac (5%)
Small Poles (5-10 inch dbh)	20% *	66%	24,037 ac (39%)	21,072 ac (34%)	22,340 ac (36%)
Large Poles (Mature) (>10 inch dbh)	60% *	11%	28,462 ac (46%)	27,393 ac (45%)	27,849 ac (45%)
> 5.0 inch dbh with >50% canopy cover	60% (>12 inch dbh)	69%	45,576 ac (76%)**	42,689 ac (70%)**	44,301 ac (72%)**
*Reynolds' small poles are 5-12 inches dbh, large poles >12 inches dbh [dbh = diameter at breast height].					
**Canopy cover (>40%) and pole dbh (> 5.0 inches) are based on categories in the R1-VMAP dataset.					

Regeneration and intermediate harvest associated with alternative 2 or 3 will create a mosaic of seral stages in the project area that should provide a diverse prey base for goshawks. While the percentage of shrub/forb/grasses does not change in any alternative, prescribed fire should improve the vigor of these vegetation communities that benefit goshawk prey species such as ground squirrels and grouse. The habitat requirements of important prey (i.e., snowshoe hare, ground squirrel, red squirrel, grouse species) include early seral to mature forests and forest openings (Squires and Kennedy 2006). Hargis et al. (1994) concluded that an “emphasis should be placed on creating or maintaining vegetation diversity,” and “that timber harvests be designed to create a juxtaposition of seral stages.” So, even though the foraging habitat diversity post-treatment is not similar to Reynolds et al. (1992), it is compatible with their objectives of providing quality habitat for goshawk prey and providing conditions that enhance goshawk foraging opportunities (Ibid p. 26).

PFA Analysis

The post-fledging area (PFA) analysis is completed just for the (2) territories that were active after the mountain pine beetle infestation: Tenmile Creek nest PFA (active in 2013) and Grizzly Gulch nest PFA (active in 2014). Table 149 and Table 150 show that there are no changes in seral stages, canopy cover, or shrub/forb/grass communities relative to the percentages recommended by Reynolds et al. (1992) and those described by Clough (2000) in Montana. In other words, the implementation of alternative 2 (or 3) would result in no change in the structural conditions of the habitat within the Tenmile Creek and Grizzly Gulch PFAs compared to the existing conditions of the two.

It should be noted that a small portion of the Tenmile Creek PFA is included in a private land buffer treatment type (of equal amounts) in both alternatives 2 and 3 (Figure 84 and Figure 85). This treatment type is designed to reduce hazardous fuels within a 600-foot wide buffer around private lands. Dead and down hazard fuels within the private land buffer may be removed or rearranged and pile or jackpot burned. Some standing hazard (dead or dying) trees and ladder fuels may also be felled, which is not expected to measurably change the structural conditions of the habitat within the PFA. Also noteworthy is that approximately one half of the Grizzly Gulch PFA will be treated with low-severity prescribed fire under alternative 2 (but not under alternative 3). The low-severity prescribed fire is also not expected to change the structural condition of the habitat within the Grizzly Gulch PFA.

Table 149. Vegetation composition (Habitat Diversity Matrix) within the Tenmile Creek Nest post-fledging area (PFA) per alternative (based on R1-VMAP estimates) compared with ranges in west central Montana (Clough 2000) and recommendations for ranges in the southwestern U.S. (Reynolds et al. 1992).

Stand Size Class and Canopy Cover	Recommendations for Home Ranges in the Southwest U.S. (Reynolds et al. 1992)	Existing Condition Home Ranges in West-Central Montana (Clough 2000)	Alternative 1	Alternative 2	Alternative 3
Grass/Forb/Shrub	10%	7%	3 ac (1%)	3 ac (1%)	3 ac (1%)
Seedling/Sapling (<5 inch dbh)	10%	9%	0 ac (0%)	0 ac (0%)	0 ac (0%)
Small Poles (5-10 inch dbh)	20% *	66%	203 ac (49%)	203 ac (49%)	203 ac (49%)
Large Poles (Mature) (>10 inch dbh)	60% *	11%	148 ac (36%)	148 ac (36%)	148 ac (36%)
> 5.0 inch dbh with >50% canopy cover	60% (>12 inch dbh)	69%	329 ac (79%)**	329 ac (79%)**	329 ac (79%)**
*Reynolds' small poles are 5-12 inches dbh, large poles >12 inches dbh [dbh = diameter at breast height]. **Canopy cover (>40%) and pole dbh (> 5.0 inches) are based on categories in the R1-VMAP dataset					

Table 150. Vegetation composition (Habitat Diversity Matrix) within the Grizzly Gulch Nest post-fledging area (PFA) per alternative (based on R1-VMAP estimates) compared with ranges in west central Montana (Clough 2000) and recommendations for ranges in the southwestern U.S. (Reynolds et al. 1992).

Stand Size Class and Canopy Cover	Recommendations for Home Ranges in the Southwest U.S. (Reynolds et al. 1992)	Existing Condition Home Ranges in West-Central Montana (Clough 2000)	Alternative 1	Alternative 2	Alternative 3
Grass/Forb/Shrub	10%	7%	145 ac (35%)	145 ac (35%)	145 ac (35%)
Seedling/Sapling (<5 inch dbh)	10%	9%	0 ac (0%)	0 ac (0%)	0 ac (0%)

Stand Size Class and Canopy Cover	Recommendations for Home Ranges in the Southwest U.S. (Reynolds <i>et al.</i> 1992)	Existing Condition Home Ranges in West-Central Montana (Clough 2000)	Alternative 1	Alternative 2	Alternative 3
Small Poles (5-10 inch dbh)	20% *	66%	51 ac (12%)	51 ac (12%)	51 ac (12%)
Large Poles (Mature) (>10 inch dbh)	60% *	11%	219 ac (53%)	219 ac (53%)	219 ac (53%)
> 5.0 inch dbh with >50% canopy cover	60% (>12 inch dbh)	69%	152 ac (37%)**	152 ac (37%)**	152 ac (37%)**
*Reynolds' small poles are 5-12 inches dbh, large poles >12 inches dbh [dbh = diameter at breast height]. **Canopy cover (>40%) and pole dbh (> 5.0 inches) are based on categories in the R1-VMAP dataset					

The above data indicate that the diversity of vegetative conditions in the two PFAs that were known to have been used after the mountain pine beetle infestation are not analogous with either Reynolds or Clough in all cases – yet those structural vegetative conditions would not be altered by alternative 2 or 3, except possibly to a slight degree by the application of low-severity prescribed fire on approximately half of the Grizzly Gulch PFA. The low-severity prescribed fire is designed to improve and maintain existing dry forest savannah and grass-forb-shrub areas.

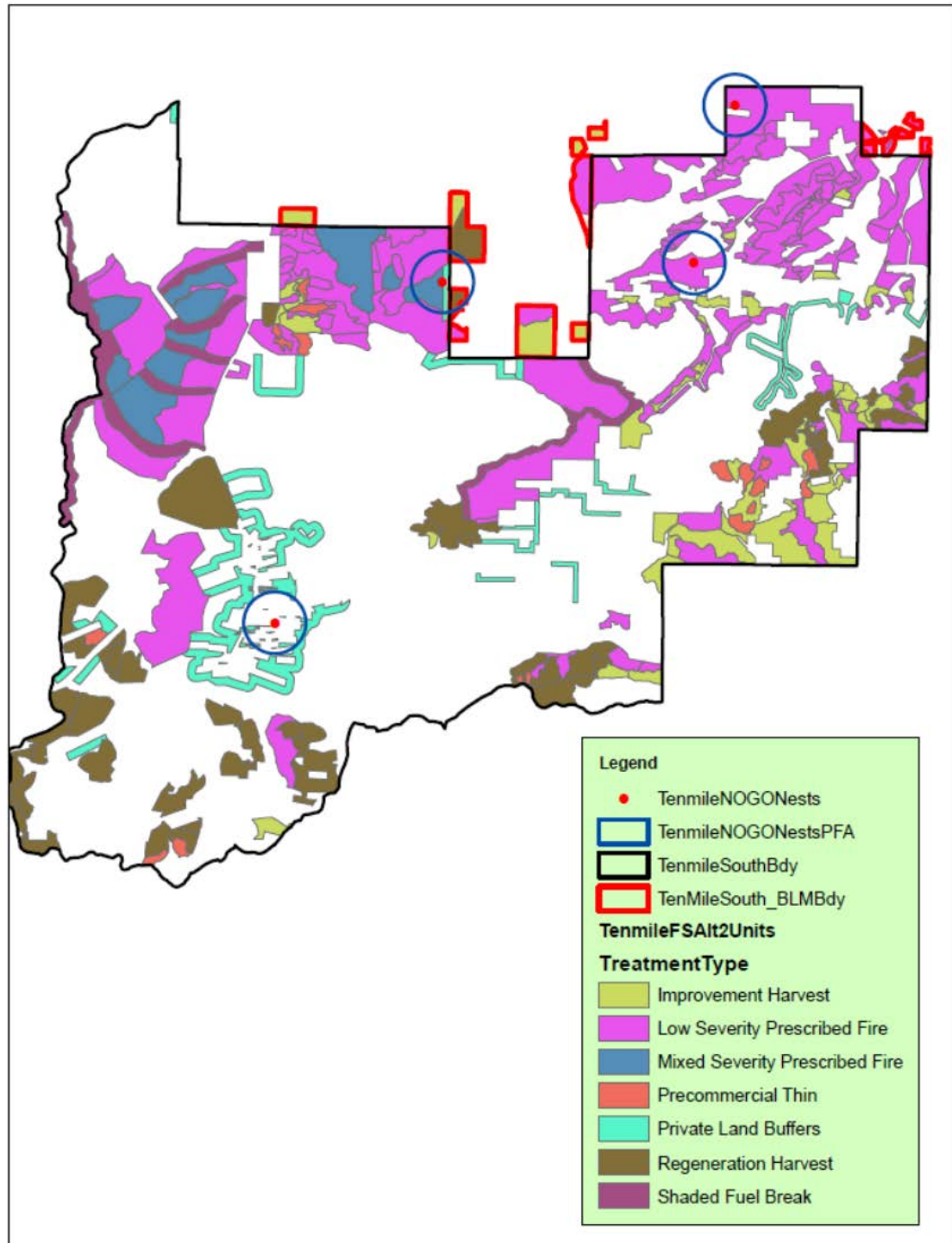


Figure 84. Alternative 2 treatment types relative to post fledging areas (PFAs) in the Tenmile – South Helena project area.

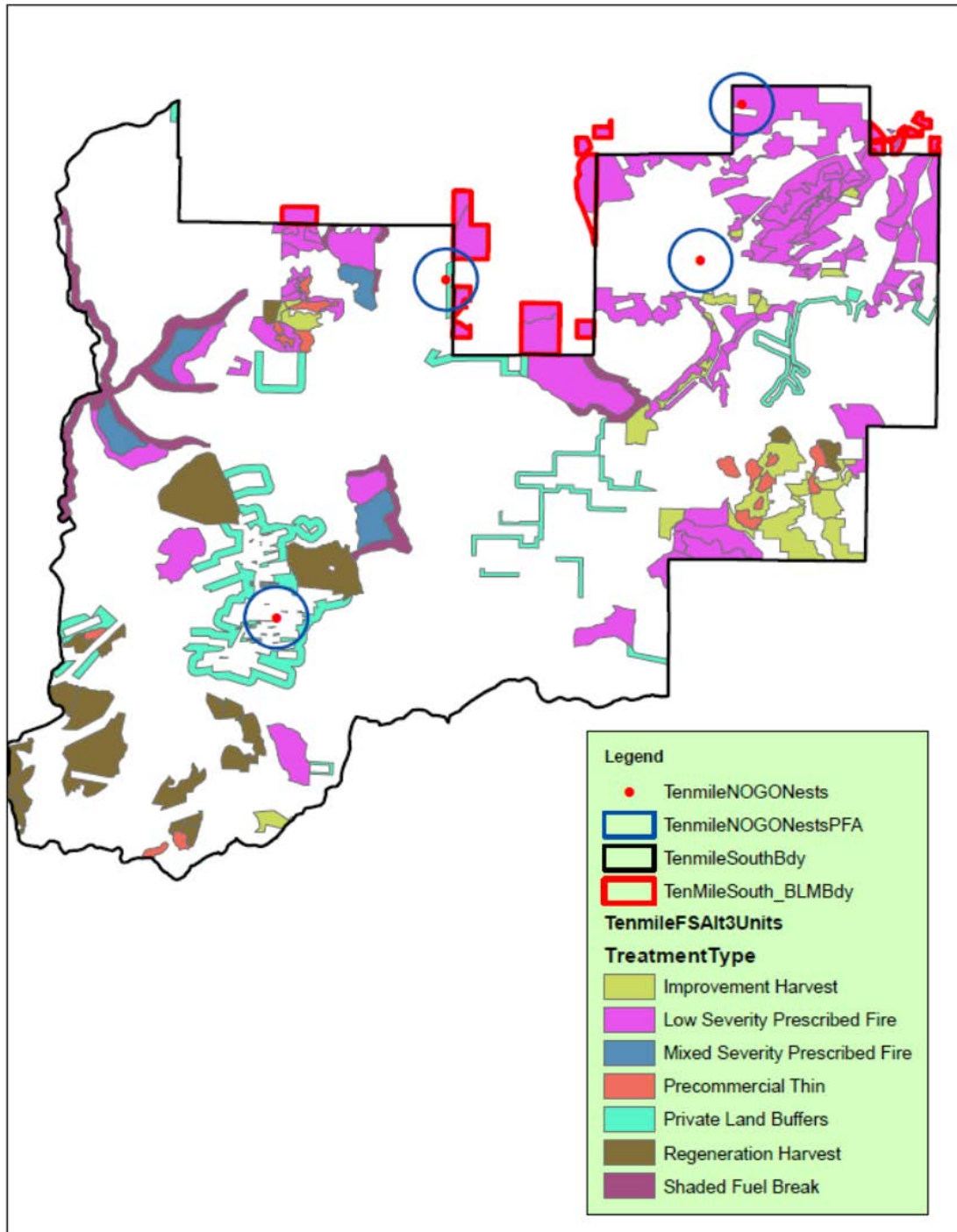


Figure 85. Alternative 3 treatment types relative to post fledging areas (PFAs) in the Tenmile – South Helena project area.

Action Alternatives Cumulative Effects

Cumulative effects are the incremental impacts that the direct and indirect effects associated with the action alternatives have on goshawk habitat in the context of the myriad of other past, present, and future effects on goshawk habitat from unrelated activities. The cumulative effects analysis considers spatial and temporal boundaries, how past activities have contributed to the existing condition, and whether the ecosystem

can accommodate additional effects. Table 151 summarizes the key items that are taken into consideration for the cumulative effects analysis for goshawk habitat. See also Appendix E to the Wildlife Report.

Table 151. Cumulative effects considered for goshawk habitat in the Tenmile – South Helena project area.

Parameters	Cumulative Effects Analysis Considerations Defined
Spatial Boundary	The spatial boundary is an area beyond which goshawk habitat is no longer measurably affected. The Tenmile – South Helena project area satisfies this requirement because of its large size and scale at which the effects to home ranges in the project area would no longer be measurable. The Tenmile – South Helena project area also provides a sufficient landscape to assess pattern and structure in the context of larger processes.
Temporal Boundary	The temporal boundary ranges from the 1950s (due to a lack of earlier records in the FACTS database) to those future projects that are either listed in our SOPA or are planned or implemented on private land within the project area.
Past Activities and Existing Condition	The effects of past activities are reflected in the existing condition. Past activities shaped the age class, density, and species composition of the existing goshawk habitat that comprises the Tenmile - South Helena project area today. The existing condition, which incorporates the changes due to past activities, has been measured by remote sensing and field validation.
Activities Considered in Cumulative Effects	Past activities that are included in the cumulative effects analysis include timber harvest, fuels activities, private land timber harvest, and the McDonald Pass Fire.
	Ongoing and future activities include public fire wood cutting/gathering, Red Mountain Flume/Chessman Reservoir Project, the Clancy Unionville Vegetation Manipulation and Travel Management Project, and private land timber harvest and residential development.
Measurement Indicators	Measurements include effects to foraging and nesting habitat.
Thresholds	The threshold is the amount of remaining nesting habitat within the Tenmile – South Helena project area in patches of 40 acres.
Methods	Past, ongoing, and reasonably foreseeable activities are described quantitatively based on acres of foraging or nesting habitat affected. Impacts of past activities are based on the FACTS database and summarized according to the types of treatments recorded in the database. The effects on goshawk habitat are based on observed changes to stand structure in the tree dominance types that are capable of providing goshawk habitat. See <i>Criteria for Wildlife Models Helena National Forest</i> (USDA 2009) and the <i>Forest Vegetation Report</i> .
Assumptions	Intermediate and regeneration harvest are assumed to remove foraging or nesting habitat; fuels activities are assumed to create open understories and promote shrub and grassland regeneration.

Past Activities

Numerous past activities never had, or no longer have, effects to which this Tenmile – South Helena Project would contribute. Other projects that involved vegetation manipulation (e.g. trail reconstruction, timber harvest, and fuels activities) may have impacted goshawk habitat at the time of the activity. Some of these impacts may still be apparent in those areas not yet capable of meeting goshawk habitat requirements. Table 152 summarizes the effects of timber harvest during three time periods on goshawk habitat currently existing in the project area. Most of the stands that have been harvested in the past do not yet provide nesting habitat while most of those stands do provide foraging habitat for goshawks today.

Fuels activities that occurred in the past mainly focused on reducing surface fuels. Many of these areas that were treated prior to the 1980s have returned to their ‘pre-treatment’ conditions especially in favorable growing conditions that accelerate understory development. Fuels activities that have occurred since the 1980s have also reduced surface fuels and created more open conditions that favor shrub and grassland development. These activities have contributed to structural characteristics that currently provide both nesting and foraging habitat.

The MacDonald Pass wildfire burned approximately 170 acres in 2009. This wildfire was of moderate to high intensity, which resulted in a fire mosaic that removed approximately 60 percent of the potential goshawk nesting habitat. In the cooler portions of this fire mosaic the understory has been regenerated and now provides foraging opportunities for goshawks.

Table 152. Past Forest Service timber harvest and fuels activities and their impacts on the availability of existing goshawk habitat in the Tenmile – South Helena project area.

Decade	Harvest Type	Acres	Effect
Pre -1960s through 1970s	Regeneration Harvest	489	Potential goshawk habitat that was regenerated during this time period is currently composed of pole size trees (5-10" in size) that contribute to foraging habitat today. The intermediate harvest treatments that occurred during this time period are now open grown stands that include large trees, some of which may be providing nesting habitat.
	Intermediate Harvest	3	
1980s through 1990s	Regeneration	335	Potential goshawk habitat that was regenerated during this time period is currently composed of young sapling sized trees (up to 5" in size) that contribute to foraging habitat today. The intermediate harvest treatments have resulted in stands that are now open grown with larger trees; however the understories aren't as developed as those areas were treated in an earlier time period. These stands may provide some nesting habitat; at a minimum foraging habitat is currently being provided in these stands.
	Intermediate	104	
2000 to Present	Regeneration	637	Potential goshawk habitat that was regenerated during this time period is currently in the stand initiation phase and in some instances large trees remain. These areas mainly provide foraging habitat today. The intermediate treatments resulted in stands with larger trees and open understories that may provide some nesting habitat, but a majority of these stands currently provide foraging habitat.
	Intermediate	531	

Ongoing Activities

Ongoing activities that may have effects to goshawk habitat are summarized in Table 153 below. One such activity is the Red Mountain Flume/Chessman Reservoir Project, which was designed to remove 490 acres of dead trees and most of the woody debris from

around Chessman Reservoir and the Red Mountain Flume. Analysis for this project concluded that the treatments would have no significant effect on goshawk nesting, PFA, or foraging habitat in that local area.

Another ongoing project is the Clancy Unionville Vegetation Manipulation and Travel Management Project. The main potential impact to goshawks (from the project's thinning, clearcutting, and seed-tree cutting of approximately 1,932 acres) was primarily the transformation of some blocks of nesting habitat to foraging habitat, which has already occurred. The analysis for this project concluded that timber and (ongoing) fuels treatments would leave suitable nesting habitat for the known or suspected goshawks within the project area.

Table 153. Ongoing activities that may impact goshawk habitat in the Tenmile – South Helena project area.

Activity	Effect
Red Mountain Flume/Chessman Reservoir Project	Approximately 500 acres of harvest and fuels treatments starting in 2014. Analysis concluded that project would have no significant effect on goshawk nesting, PFA, or foraging habitat within the Tenmile Creek breeding home range/territory.
Clancy Unionville Vegetation Manipulation and Travel Management Project	Forest vegetation improvements and Fuels treatments (with Watershed and Road improvements, including road maintenance, decommissioning and Travel Mgmt.). Timber harvest completed, fuels treatments ongoing. Project analysis concluded that goshawks would be unaffected by implementation of fuels treatments.
Private Land Timber Harvest and Residential Development	Timber harvest on private lands is lessening, but ongoing, which will further reduce snags and vegetation connectivity. Residential development of private lands will continue, which will increase habitat fragmentation.
Public Firewood Cutting	Ongoing firewood cutting results in removal of snags along roadsides and reduces snag availability in those locations.

Other ongoing activities that may impact goshawk habitat include general road use and management, which could disturb nesting birds depending on the level of use and activity. Private land development, primarily cabin and home development along the eastern fringe of the project area, could also impact potential goshawk habitat through removal of trees and possibly permanent conversion to non-forest habitats. Public firewood cutting/gathering would also have a minor influence on goshawk habitat along public roads, primarily by reducing snag densities used by some goshawk prey species. Cattle grazing in the project area (on private lands and ten Forest Service cattle and horse allotments) would also have a minor influence on goshawk foraging habitat, primarily by reducing residual grasses and forbs, and the structure and vigor of upland and riparian shrub species, which are used by some goshawk prey species.

Reasonably Foreseeable Activities

The private lands within the project area that are capable of supporting forests are dominated by lodgepole pine, either mature trees or seedling/sapling stands that are the result of regeneration harvest in recent decades. Nearly all of these mature lodgepole pines have succumbed to mountain pine beetle, much of which has been salvage logged. Because the sawtimber component that was economical to remove has been removed,

and because the balance of the lands are at least 50 years from again producing saw logs, it is likely that there will be very little if any harvest on the private lands within the project area for the next five decades.

Private lands just outside of the project area are a mix of lodgepole pine-dominated stands (with a similar history as those within the project area) and the lower elevation stands are dominated by ponderosa pine and Douglas-fir. Much of the lower elevation timber component has also been subject to past timber harvest, but there is the potential for some additional harvest, however the level and timing of this harvest is uncertain. Adjacent goshawk habitat may be impacted if timber harvest removes nesting and/or foraging habitat, which may impact some goshawk home ranges that could extend beyond the project area boundary.

Cattle grazing in, and around, the project area is expected to continue at current levels. The impacts to foraging habitat are expected to lessen following the opening up of the landscape from the past mountain pine beetle infestation, as forage plant species and biomass used by goshawk prey species increase – assuming cattle grazing (numbers and or duration) isn't increased commensurately.

The Divide Travel Plan, once implemented, could benefit goshawks by having fewer open roads, which could reduce the potential for disturbances to goshawks, particularly during the nesting and post fledging periods.

Cumulative Effects Conclusions for the Action Alternatives

Implementation of alternative 2 would result in regeneration (harvest) of 925 acres of nesting habitat and 3,920 acres of foraging habitat. Approximately 2,626 acres of nesting habitat and 3,581 acres of foraging habitat would be treated with intermediate harvest. Pre-commercial thinning would occur on 160 acres of nesting habitat and 386 acres of foraging habitat. Prescribed burning would occur on 7,484 acres of nesting habitat and 10,741 acres of foraging habitat. These activities would contribute to the effects associated with past timber and fuels activities that have shaped the existing vegetative condition. Alternative 2 would also contribute to the effects associated with the following ongoing and reasonably foreseeable projects: Red Mountain Flume/Chessman Reservoir and the Clancy Unionville Vegetation Manipulation and Travel Management Projects; private land timber harvest and development; firewood retrieval; and cattle grazing, though possibly somewhat mitigated by fewer open roads and potential reduced disturbances if the proposed North Divide Travel Plan is implemented. As with these projects and activities, implementation of alternative 2 would remove nesting habitat; the composition of foraging habitat would be changed to favor prey species associated with early seral forests (except in the case of private land development where habitat may be permanently removed). However, ample acres of nesting habitat would remain to provide the requisite amount per home range.

The Tenmile – South Helena project area is approximately 61,395 acres, which potentially could contain between 10 and 12 goshawk home ranges. After implementation of alternative 2, approximately 16,595 acres of nesting habitat would be available. Even with the additional loss of some nesting habitat acres from the current ongoing projects (such as Red Mountain Flume/Chessman Reservoir and the Clancy

Unionville Vegetation Manipulation and Travel Management projects) goshawk nesting habitat would still remain in excess of that needed to sustain up to 12 pairs of goshawks in the project area.

The cumulative effects associated with the implementation of alternative 3 are similar to those associated with alternative 2 except that fewer acres of foraging and nesting habitat would be treated. The additional acres of nesting habitat that would remain in alternative 3 would contribute to nesting habitat that is already in excess of that needed to provide the requisite amount of nesting habitat per home range – between 180 and 240 acres. Approximately 18,425 acres of nesting habitat would remain after implementation of alternative 3. With the additional loss of some nesting habitat associated with the current ongoing projects (Red Mountain Flume/Chessman Reservoir and the Clancy Unionville Vegetation Manipulation and Travel Management projects), goshawk nesting habitat would still remain in excess of that needed to sustain up to 12 pairs of goshawks in the project area.

Irreversible and Irretrievable Commitment of Resources

There are no irreversible or irretrievable commitments of resources.

Conclusions

Alternative 1 retains the status quo. Clearly, portions of the project area, primarily Douglas-fir dominated stands, provide adequate nesting and foraging habitat to support active goshawk nests. These Douglas-fir dominated stands will continue to provide nesting habitat in the short term (up to 10 years). Stands impacted by the mountain pine beetle would continue to lose nest habitat characteristics and to the extent that the ongoing mountain pine beetle mortality exacerbates wildfire, even the Douglas-fir forests could be susceptible to loss. Conversely, as a result of fire suppression, many of the forested stands in the project area that have not been killed by mountain pine beetle are developing dense understories which makes goshawk foraging difficult. There is evidence to suggest that goshawks, as large-bodied, visual predators, avoid overly dense habitats where physical or visual access to prey is limited. Habitat management practices, particularly fire suppression activities, which have allowed forests to become too dense for flight below or within the canopy may also be detrimental (Reynolds 1983). Such overly dense forest structures would limit goshawk detection of and access to prey. Harvest practices such as light thinning may, in these cases, actually improve or create foraging habitat for goshawks.

The action alternatives would result in the retention of more than enough nesting habitat for the 4 known and 10 to 12 estimated home ranges in the project area. Alternative 3, however, would retain more nesting habitat than alternative 2, at least in the short-term. This is noteworthy because goshawks exhibit high nest site fidelity even in situations when the nest site has been modified (Reynolds 1983, Woodbridge and Detrich 1994, Patla 1997). The implication of this behavior is that fidelity to nest areas may override response to reduced suitability and result in a lag effect before goshawks re-locate to more suitable habitat which in turn could affect reproductive success.

The only treatments that would occur within the 2 most recently occupied PFAs is a small amount of private land buffer treatment in the Tennmile Creek PFA under both

action alternatives, and a low severity prescribed fire across about ½ of the Grizzly Gulch PFA under alternative 2. While evidence exists to support a diversity of seral stages within PFAs, retaining the integrity of the PFA in the short term could be beneficial for those goshawks that have been nesting in the project area over the last couple years, and alternative 3 would be better than alternative 2 in this regard. However, Squires and Kennedy (2006) in their assessment of the current knowledge and information needs for goshawks concluded that forest management, such as controlled fire and thinning, may improve or degrade habitat depending on implementation, especially as they affect the density of large trees and canopy closure. Also, Reynolds et al. (1992) recommend thinning and burning in the PFA to meet desired stand conditions. None of the treatments proposed would result in a measurable change in the structural conditions of either PFA (See Table 143 and Table 144).

Alternative 2 is designed to promote greater vegetation diversity than alternative 3. Hargis et al. (1994) concluded that “emphasis should be placed on creating or maintaining vegetation diversity” and “that timber harvests be designed to create a juxtaposition of seral stages”. Alternative 2 would result in the removal of more snags that provide foraging habitat than alternative 3; however, snags would remain abundant within the project area as a result of the mortality associated with the mountain pine beetles.

Vegetative changes associated with the action alternatives would result in reduced forest canopy cover in some stands which, in turn, may favor the habitat needs of more open-forested competitors, such as red-tailed hawks, thereby decreasing the amount of habitat available to goshawks (USDI FWS 1998). Gatto et al. (2005) and Reynolds et al. (1992) indicated that goshawks have approximately 48 percent dietary overlap in prey species with red-tailed hawks, including prey that occupy a variety of unforested, forested, and forest edge habitats. However, La Sorte et al. (2004) noted distinct differences in how goshawks and red-tailed hawks use habitats at fine and larger landscape scales. For example, red-tailed hawks choose nest-sites on steep slopes with dense understories, enter the nest from above the canopy, and have a commanding view of the surrounding country from the nest. Conversely, goshawks choose nest-sites on moderate slopes with mature trees and open understories, enter the nest from below the canopy, and have a limited view from the nest. Red-tailed hawk nesting territories are often comprised of large open patches with scattered trees in fragmented forest, whereas goshawk nesting territories are often more continuous forest with smaller openings and edges. Theoretically then, goshawk habitat may be reduced with increased fragmentation and red-tailed hawk habitat may increase (La Sorte et al. 2004). Whether some threshold level of fragmentation exists, beyond which red-tailed hawks completely replace goshawks, is unknown. To date, no scientific studies have conclusively documented such a replacement.

The desired condition for goshawks includes (1) between 180 and 240 acres nesting habitat per 5,000 to 5,820 acre territory; (2) heterogeneous foraging habitat including mature forest as well as a mix of other forest and non-forest components; and (3) approximately 420 acres post-fledging habitat that includes some mid to late-seral forests with structural diversity in the understory. Implementation of any of the action alternatives would result in the retention of the requisite amounts of nesting habitat.

However, risks of wildfire associated with alternative 1 are high and if wildfire is realized in the project area, nesting habitat could be reduced or eliminated. The action alternatives are designed to promote stand sustainability through time which in turn could result in the retention of more nesting habitat over time in the project area.

Alternative 2 is designed to promote long-term resiliency and sustainability of the forested stands in the project area more so than alternative 3 because more acres would be treated. Relative to mountain pine beetle, Schmid and Mata (2005) found their occurrence in unmanaged stands could overwhelm adjacent managed stands, particularly those treated with intermediate harvest methods such as the improvement harvest treatment, which is designed to retain portions of the original stand – i.e. large trees that are food for mountain pine beetles. Because fewer acres are proposed for treatment in alternative 3, it is possible that the efficacy of the proposed treatments may be less than that in alternatives 2. Other areas that remain untreated in alternative 3 may also be susceptible to spruce budworm or Douglas-fir beetle, which could impede the ability of a given stand to yield large trees which are important for nesting.

Alternative 2 should also result in greater vegetation diversity. The structural diversity of the most recently occupied PFAs would be unchanged (from existing condition) by the action alternatives.

In summary, goshawk habitat would continue to be available at the project level and beyond. Forest-wide habitat thresholds have not been breached (See Viability Section) and there are ample reasons to infer that goshawks and their habitat will be maintained at the Forest level (excerpted from USDA 2009b):

- Goshawk habitat in R1 is abundant and well distributed where it occurs naturally, and more forest, and therefore nesting habitat, exists on today's landscape than what occurred historically (Samson 2005).
- There have been substantial increases in connectivity for forested habitat since Euro-American settlement (Samson 2005).
- The level of timber harvest of the forested landscape in R1 is insignificant (Samson 2005).
- The suppression of natural ecological processes has increased and continues to increase the amount of forested habitat (Samson 2005).
- Not a single known nest site in R1 is isolated from other known nests by more than the goshawks' estimated dispersal distance.
- The northern goshawk is secure in terms of persistence, <http://www.natureserve.org/explorer> accessed May 26, 2015.
- Below (and not above) a threshold of 20 to 30 percent of historical habitat amounts, the effects of fragmentation (i.e. patch size and isolation) are suggested to have a negative impact on species persistence. No indication exists that forested ecosystems in R1 have reached the 20 to 30 percent threshold of historical.

- Forested systems in R1 are more extensive and are less fragmented than in historical (~1800 A.D.) times from an increase in conifers into grasslands (Hessburg and Agee 2003; Gallant et al. 2003; Hessburg et al. 2005).
- The effects of habitat fragmentation on birds are less in the western United States compared to the midwestern and eastern United States because western landscapes were naturally more fragmented in historical times.
- A comparison of habitat estimates for maintaining viable populations to that available on each Forest indicates that habitat is available in excess to that needed, given the natural distribution of the species and its habitat as mapped and according to the scientific literature (Samson 2006).

Forest Plan Consistency

The goshawk is a management indicator for old growth dependent species; as such it's intended to be a bellwether of the effects of management activities on representative wildlife habitats with the objective of ensuring that viable populations of existing native and desirable non-native animal species are maintained.

Federal laws and direction applicable to management indicator species include the National Forest Management Act (NFMA), the Forest Service Manual, and the Helena National Forest Plan. The NFMA requires the Forest Service to “provide for diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives” [16 USC 1604(g)(3)(B)]. All alternatives are consistent with this requirement. Goshawk habitat would continue to be abundant and well-distributed and species' viability would be maintained across the Forest. See also the Viability Analysis Section.

Migratory Bird Species

Affected Environment

Considerations Pertinent to Management

In 1988, an amendment to the Fish and Wildlife Conservation Act mandated that the U.S. Fish and Wildlife Service “identify species, subspecies, and populations of all migratory non-game birds that, without additional conservation actions, are likely to become candidates for listing under the ESA of 1973”. A subsequent report, Birds of Conservation Concern 2002, identified migratory and non-migratory bird species (in addition to those already designated as federally threatened or endangered) that represented the highest conservation priority. In that report (and in a 2008 update), North America is broken down into 66 Bird Conservation Regions (BCRs), with “bird species of concern” identified for each region. The Helena NF is situated at the boundary of BCR 10 (northern Rockies) and BCR 17 (badlands and prairies) but supports bird populations more characteristic of BCR 10. The migratory bird list for that BCR and the accounting in MFWP's Montana Field Guide (<http://fieldguide.mt.gov/>) have been used to determine which birds may be of particular management concern in the Divide landscape. This grouping takes in all migratory and yearlong resident landbirds and shorebirds identified as “species of concern”. It does not include waterfowl or upland gamebirds.

More specific management direction for dealing with landbirds and shorebirds in project planning (including NEPA documents) comes from the Forest Service's Landbird Conservation Strategic Plan (2000) and Executive Order 13186 (2001) [Fed Reg. Vol 66, No. 11, p. 3853-3856]. More recently (2008), the Forest Service and the U.S. Fish and Wildlife Service signed a memorandum of understanding (MOU) that directs the Forest Service to approach management of migratory birds in the following way: (1) focus on bird populations; (2) focus on habitat restoration and enhancement where actions can benefit specific ecosystems and migratory birds dependent on them; (3) recognize that actions taken to benefit some migratory bird populations may adversely affect other migratory bird populations; and (4) recognize that actions that may provide long-term benefits to migratory birds may have short-term impacts on individual birds. The parties agreed that through the NEPA process, the Forest Service would evaluate the effects of agency actions on migratory birds, focusing first on species of management concern along with their priority habitats and key risk factors. The MOU expired in December 2013, but discussions are underway to issue a new Memorandum in the near future. This report deals with priority bird species as if the Memorandum were in effect.

In April 2010, the BLM also entered into a similar "Memorandum of Understanding" to promote the conservation of migratory birds (USDI BLM and USDI FWS 2010). Section F obliges the BLM within its NEPA process "to evaluate the effects of the BLM's actions on migratory birds during the NEPA process, if any, and identify where take reasonably attributable to agency actions may have a measurable negative effect on migratory bird populations, focusing first on species of concern, priority habitats, and key risk factors".

Population Status in the Project Area

Over a period of 14 years (1994-2008), the Helena NF participated in the USFS Northern Region Landbird Monitoring Program (LBMP) in partnership with the Avian Science Center (ASC) at the University of Montana (Hutto and Young 2002). Each year, from late spring through mid-summer, the ASC conducted standardized surveys along a series of pre-determined transects across the Forest. The program has provided data on population trends, habitat relationships, and effects from past management activities for birds breeding throughout western Montana and northern Idaho. According to Hutto, "[t]here are not nearly enough years of data to make meaningful use of our population trend data yet, but the preliminary data suggest that most populations have remained fairly stable during the 12-year period from 1994-2006" Results from the first half of the program's fieldwork are summarized in Hutto and Young (1999).

The Divide landscape includes 19 point-count transects (4 in the project area) that were monitored in different combinations from 1994-2006. In monitoring a transect, surveyors identified and counted birds for 10 minutes at each of 10 points—with transects being worked once a year in late spring or early summer. Surveyors identified birds primarily by songs and calls and, to a lesser extent, by sight. So, they did not always pick up birds that were particularly secretive (American bitterns), uncommon (Brewer's sparrows), or attached to habitat that lacked transects (bobolinks) during their relatively short sessions at each transect point. Some of these species, however, have been identified fortuitously over the past 2 decades during general wildlife fieldwork or by special survey efforts that targeted particular species (goshawks, flammulated owls, boreal owls, and black-backed woodpeckers, for example).

Over the 12 year period, 60 species of birds were identified along established LBMP survey transects in the Divide landscape and an additional 36 species were picked up during general and targeted wildlife survey work. These enumerations do not include waterfowl, upland gamebirds, or obvious transients (peregrine falcons, ferruginous hawks, and Baird's sparrows, among others). Of the 96 species, nineteen are classified as "species of concern" and/or "birds of conservation concern" in the Montana portion of BCR 10 and are displayed in Table 154 as species whose populations could be compromised by certain land management activities.

The Tenmile – South Helena project area provides habitat opportunity for most of these species—some much more than others. Some are open-country species found in prairies and valley lands on the fringes of the combination boundary (Swainson's hawks, prairie falcons). Some of the species found in and around the project area are affected negatively by certain land management practices, others positively, and some little at all. Hejl and others (1995) recommend a bird conservation strategy composed of three parts: (1) maintain, mimic, and restore natural vegetation patterns and processes; (2) ensure that the specific habitat components required by focus species are created and/or maintained; and (3) monitor the habitats and individual species. Table 154 also indicates which birds are carried forward in analysis and the respective section.

Table 154. Resident Bird Species in the Divide Landscape that have been identified as (1) "Birds of Conservation Concern" in Bird Conservation Region 10 by the U.S. Fish and Wildlife Service or (2) "Species of Concern" in the State of Montana by the Montana Natural Heritage Program (MNHP). "Relative abundance" is derived from field observation in the Divide landscape

Species	List	Relative Abundance	Habitat Preferences and Limiting Factors	Analysis Section
Swainson's Hawk	USFWS	Uncommon—limited to the fringes of the project area	Swainson's hawks are similar in behavior and foraging patterns to red-tailed hawks, but their populations are much less robust, in part because of problems on their winter ranges in South America. They occur only on the fringes of the project area in grassland and agricultural fields, nesting in isolated trees and hunting for small mammals, reptiles, and large insects.	Not carried forward in additional analyses since the project would have no effect to the habitat.
Golden Eagle	MNHP	Rare	Golden eagles nest on cliffs and large trees. They forage most often over upland grasslands and open woodlands, where prey is visible. Numbers are limited by territorial competition with other eagles (and other raptors) and by mortality from shooting, poisoning, and electrocution on powerlines.	Not carried forward in additional analyses since the project would have no effect to the habitat.

Species	List	Relative Abundance	Habitat Preferences and Limiting Factors	Analysis Section
Prairie Falcon	MNHP	Rare—limited to the fringes of the project area	Prairie falcons establish eyries on high cliffs, preying on birds that can be knocked out of the air wherever they occur. They are less dependent on aquatic habitat than peregrine falcons and appear more versatile in their choice of nest sites. Nonetheless, numbers are limited by the availability of nesting cliffs, as well as by the logistics of ongoing recovery from decimated populations in the 20 th century.	Not carried forward in additional analyses since the project would have no effect to the habitat.
Northern Goshawk	MNHP	Uncommon but regularly distributed	Goshawks nest and fledge young in mature closed-canopied forest stands but hunt in a variety of forest formations, as well as in open habitats near forest edges. Availability of nesting/ post-fledging habitat and the density of prey are primary limiting factors. Low population density is driven by the need for large home ranges.	Analyzed in the Northern Goshawk section
Great Gray Owl	MNHP	Uncommon but often observed	Great gray owls nest in the upper reaches of large broken-topped trees in mature/ old-growth forest (usually fairly dense). They forage in a variety of habitats, including wet meadows, fields, and bogs, as well as coniferous forest. In some areas, great gray owl populations are limited by periodic shortages of prey; in others, a paucity of suitable nest trees is the primary factor.	Not carried forward in additional analyses since the project would have no effect to the habitat.
Boreal Owl	MNHP	Relatively uncommon overall, but usually well distributed in suitable habitat	Boreal owls nest in tree cavities and hunt at night in higher elevation conifer forests—usually Engelmann spruce, subalpine fir, and lodgepole pine. These diminutive owls are more common than once thought, but they are secretive and difficult to census. Numbers are limited by territoriality and the availability of suitable habitat.	Not carried forward in additional analyses since the project would have no effect to the habitat.
Flammulated Owl	USFWS MNHP	Rare with fragmented distribution	The flammulated owl is a small cavity nesting raptor, preferring open-grown mature or old-growth ponderosa pine forest for nesting and foraging. Inclusions of denser conifers provide roosting enclaves. They are sometimes found in Douglas-fir or aspen when suitable ponderosa pine stands are unavailable. The scarcity of open-grown stands of large ponderosa pine is the main limiting factor.	Discussed in the Dry Forested Habitat section

Species	List	Relative Abundance	Habitat Preferences and Limiting Factors	Analysis Section
Great Blue Heron	MNHP	Relatively uncommon but widespread	Great blue herons usually feed in shallow wetlands wherever they occur, including many near human development. Less often they forage for amphibians and small mammals in wet meadows or fields. They establish nesting colonies in the canopies of deciduous trees (typically cottonwoods) not far from wetland feeding areas. Populations are limited by the fragmented distribution of suitable nesting and foraging sites.	Not carried forward in additional analyses since the project would have no effect to the habitat.
Williamson's Sapsucker	USFWS	Relatively uncommon but widespread	Habitat for Williamson's sapsucker includes middle to high elevation montane and subalpine coniferous forest (including spruce-fir, Douglas-fir, western larch, lodgepole pine, and ponderosa pine), and also mixed deciduous-coniferous forest with quaking aspen.	Discussed in the Snags and Down Woody Debris section
Lewis's Woodpecker	USFWS MNHP	Currently rare, but becoming less so with increasing habitat opportunity	Lewis's woodpeckers are cavity nesters most strongly associated with burned or open grown ponderosa pine forest with a sufficient supply of snags. They usually move into burned forests several years after fire has occurred. Pine forests decimated by insect and disease may also provide suitable habitat. Lewis's woodpecker populations are limited primarily by a shortage of older, dead trees in a given area.	Not carried forward in additional analyses since the project would have no effect to the habitat.
Black-backed Woodpecker	MNHP	Currently rare because of the absence of wildfire	Black-backed woodpeckers are tightly tied to large concentrations of dead trees created by stand replacing fires. Post-fire insect populations can sustain woodpecker populations for only 3-5 years. The proliferation of dead trees created by mountain pine beetle infestation in the Divide landscape does not appear to be drawing in black-backed woodpeckers. The primary limiting factor is the erratic availability of suitable post-fire environments for these highly specialized birds.	Discussed in the Black-backed Woodpecker section
Willow Flycatcher	USFWS	Rare	Willow flycatchers are highly restricted to riparian shrub communities. Landscape-wide populations are suppressed by the fragmented and limited distribution of the key habitat association and by processes that reduce the quality of that habitat—stream channelization, livestock grazing, etc.	Discussed in the Wetlands and Riparian Habitats section

Species	List	Relative Abundance	Habitat Preferences and Limiting Factors	Analysis Section
Olive-sided Flycatcher	USFWS	Relatively uncommon	These birds generally nest and perch in dead trees in open habitats—historically, those created by fire, but also in post-insect infestation areas, logged sites with residual snags, or other open areas with tall dead trees. They are most common in spruce, lodgepole pine, and aspen habitat types. Populations are limited by the availability of snags in suitable configurations.	Discussed in the Cool Moist Forested Habitat section
Clark's Nutcracker	MNHP	Relatively common in suitable habitat	Clark's nutcrackers are conspicuous residents of higher elevation whitebark pine-dominated forests in summer and lower elevation ponderosa pine and limber pine forests in winter. They are highly dependent on the large seeds of these trees. Populations are limited primarily by the abundance and distribution of whitebark pine, which has decreased substantially with ongoing insect and disease infestation.	Discussed in the Whitebark Pine section
Rufous Hummingbird	MNHP	uncommon	Rufous hummingbirds are most common west of the Continental Divide in open habitats with an abundance of shrubs: burns, riparian shrub associations, open-grown forest, and timber harvest units. The proliferation of cutting units that provide shrubs but lack other key resources may be depressing populations. East of the Divide, populations are limited by fragmentation and overall scarcity of suitable habitat.	Not carried forward in additional analyses since the project would have no effect to the habitat.
Brown Creeper	MNHP	Uncommon overall, but usually well represented in suitable habitat	Brown creepers are small insectivorous birds that nest under the loose bark of large dead or dying trees. They are most common in mature and old-growth conifer stands with relatively dense canopy closure and a good supply of large trees and snags. The primary limiting factor for brown creepers is the decline in abundance of these dense older forest habitats.	Discussed in the Cool Moist Forested Habitat section, Snag and Woody Debris section, Habitat Fragmentation, Continental Divide Linkage, and Old Growth sections
Veery	MNHP	Rare	Veerys are small birds strongly associated with riparian willow communities—particularly those with open forest overstory—and with cottonwoods. Their population distribution is limited by the fragmented dispersion of the riparian communities on which they depend.	Not carried forward in additional analyses since the project would have no effect to the habitat.

Species	List	Relative Abundance	Habitat Preferences and Limiting Factors	Analysis Section
Green-tailed Towhee	MNHP	Uncommon	Towhees are most often observed on or near the ground in drier shrub communities—especially those with a rich diversity of shrubs. They are most common in sagebrush communities but also do well in some riparian shrub habitats. Primary limiting factors are those that threaten the health of shrub-dominated habitats, often livestock grazing in this case.	Not carried forward in additional analyses since the project would have no effect to the habitat.
Evening Grosbeak	MNHP	Relatively common in suitable habitat	Evening grosbeaks are often observed in small flocks in mixed conifer and spruce/fir forests; but they also make use of aspen, cottonwoods, and ponderosa pine. Their populations generally increase in years of insect irruptions—particularly, spruce budworm. Limiting factors include the unpredictable presence of preferred insect prey and the distribution of mature forest.	Discussed in the Whitebark Pine Section
Cassin's Finch	USFWS MNHP	Relatively common	Cassin's finches are most often found in open-grown coniferous forest—typically, ponderosa pine; but they occur across a broad array of forest types, including post-fire stands and riparian habitats. Variable conifer seed production (particularly in ponderosa pine) may be a destabilizing factor for populations.	Discussed in the Dry Forested Habitats section and Whitebark Pine section
¹ Not all of the bird species of concern in BCR 10 occur in the project area. Those not found in the project area (or that are only transient) include: Swainson's and ferruginous hawk, Williamson's sapsucker, peregrine falcon, bald eagles, upland sandpiper, long-billed curlew, yellow-billed cuckoo, black swift, Lewis's and white-headed woodpeckers, loggerhead shrike, sage thrasher, sage and McCown's longspur, and the black-rosy finch, among others.				

Topics not Analyzed in Detail

This section summarizes the status of the following resource issues:

- Aspen
- Whitebark Pine
- Old-Growth
- Edges and Ecotones
- Grassland-Shrubland Habitats
- Livestock Grazing
- Noxious Weeds
- White-tailed Deer
- Moose

- Black Bear
- Mountain Lion
- Gray Wolf
- Boreal Toad
- Fisher
- Flammulated Owl
- Black-backed Woodpecker

Aspen

Aspen in the Northern Rockies

In the conifer dominated forests of the northern Rockies, broad-leaved, deciduous aspen stands represent a primary source of wildlife habitat diversity. In addition to the distinctive overstory, aspen stands provide soft cavity-prone tree trunks with chlorophyll-rich bark and a diverse array of robust understory vegetation (Thomas 1979). As well, they often lie at the interface of conifer forest and open grassland. This ecotone-like locale combined with their productivity and contrast to the dominant conifer regime make them magnets for a whole confederacy of wildlife species (Newlon 2005).

Small mammals, amphibians, and ground nesting birds take advantage of cover provided by the typically thick growth of grasses, forbs, and low shrubs. The ground vegetation is also a source of invertebrate prey for these species as well as forage for grazers ranging from meadow voles to snowshoe hares to elk. The rapidly-regenerating aspen shoots in the understory are a prized source of browse for deer, moose, elk, and hares (though often to the detriment of stand development). The soft trunks of aspen trees provide a ready substrate for cavity dependent species, such as red-naped sapsuckers, downy woodpeckers, and northern flickers (Thomas 1979). In summer, aspen, as an “edge” environment, often provides lush, shaded resting enclaves for elk calves and deer fawns next to open country where adults are able to forage.

Fire is a primary factor in perpetuating aspen. Aspen are able to regenerate from suckers in underground root systems following fire. With the other dominant vegetation temporarily eliminated by fire, young aspen shoots are able to grow quickly. For the first 10 to 15 years after a stand replacing fire, aspen may be the dominant tree species on many sites [personal observation, Elkhorn and Big Belt Mountains]. But before long, it is often overtaken by conifer species that have grown from seed—sometimes by shade tolerant species such as Douglas-fir for which the aspen has been providing cover (Stam et al. 2008). Periodic fire will set back this conifer succession and maintain aspen on the site. But in the absence of fire, remaining aspen trees eventually lose vigor, fail to sucker and are eliminated from the community. Effective fire suppression beginning the 1930s has resulted in a notable decrease in the abundance of aspen stands in the northern Rockies compared to historical conditions (Arno 2000).

Another factor repressing aspen regeneration has been the recovery of elk, deer, and moose populations through the 20th century. The native ungulates seek out aspen as an “ice cream plant”, browsing on any young trees within the vertical browse zone year after year, thus inhibiting the ability of the stands to develop as multi-storied forest

environments (Hollenbeck and Ripple 2008). Domestic livestock also impact aspen stands by browsing and bedding down on young shoots, but in most cases they are less an impediment to aspen restoration than native browsers [personal observation, 1987-2013]. Cattle browse on young aspen shoots if the aspen stands are within their normal grazing sites, and this can exacerbate big game impacts [see Durham and Marlow 2010]. Mature aspen is susceptible to heart-rot, and the older overstory can deteriorate quickly. While the underground root/sucker systems may linger for several decades, the regenerating shoots will come to naught if heavily browsed, and the above-ground space will inevitably come to be filled with young conifers.

Area Characterization

Historically, aspen stands were widely dispersed in the project area as evidenced by scattered remnants and historic range maps [see project file]. A majority of stands were associated with seeps, springs, and riparian areas, but a number occurred on drier upland sites, including grasslands, shrublands, and talus slopes. Stands had a diversity of structure and age classes, which limited decadence. Currently, most stands are declining due to conifer colonization and overbrowsing by native herbivores and, to a lesser extent, by cattle. Many former stands have disappeared beneath the canopies of lodgepole pine and Douglas-fir forest.

Viable, multi-aged aspen stands are present in Blackhall Meadows and along the eastern boundary of the project area. But much of the aspen resource is confined to small clones (with the exception of Blackhall Meadows), besieged by encroaching conifers or impoverished by overbrowsing of the regenerating understory trees. Other potential stands are present underground beneath the canopies of conifer stands—many of which are now in the process of being released by the demise of the lodgepole pine overstory in the wake of the mountain pine beetle outbreak. This process is somewhat different than what follows stand replacing fire, so the results are difficult to predict. Fire not only removes competing conifers, allowing more light to reach regenerating aspen, but it also stimulates suckering by removing the apical dominance of mature aspen trees (Shepperd 2001). In those instances where a mature aspen canopy is in place, the loss of lodgepole pine may result in only minor improvement of aspen regeneration. Where an aspen overstory is no longer present, but the underground root system is still intact, regeneration is likely to be more vigorous.

The locations of potential aspen break-out sites have not been mapped but they are numerous and widespread. With the death of most of the lodgepole pine overstory, it is likely that young aspen will increase and, in some cases, proliferate on a number of sites throughout the project area. These incipient stands will not reach maturity, however, if they are eventually overtaken by conifers as in recent decades or if they are overwhelmed by ungulate browsing.

Whitebark Pine

General Status of Whitebark Pine Habitat

Whitebark pine is a high elevation 5-needle pine species that, while much less common than other mountain conifers, contributes to forest diversity and is an important habitat component for a number of wildlife species. Whitebark pine has been in decline since

the turn of the 20th century (Keane 1995). Prior to the early 1900s, it was more abundant in subalpine forests largely as a result of natural fires, which removed less fire resistant trees (subalpine fir, lodgepole pine, Engelmann spruce) that are often able to outcompete the whitebark (Arno and Hoff 1989). Mature whitebark pine trees are relatively resistant to low intensity fire and young seedlings do best in open, sunny post-fire conditions (Weaver 2001). As a result of fire suppression during the 20th century, natural fire cycles in seral whitebark pine communities were disrupted, resulting in this species being replaced by competitors (Keane and Parsons 2010). The competing trees crowd in around the mature whitebark pines and suppress the ability of their seedlings to regenerate in the understory. The frequent low intensity fires that occurred under the natural fire regimes in whitebark communities prevented or slowed the replacement of the pine by the more shade tolerant species, thereby aiding the regeneration and long-term maintenance of seral whitebark pine forests (Morgan and Bunting 1990).

Fire suppression has also led to an abundance of older forests, which, in turn, has resulted in greater frequency and extent of mountain pine beetle infestations. Whitebark pine, already under stress from competition with subalpine fir and lodgepole pine, is particularly susceptible to the beetle attacks. Since the early 20th century, the pines have also been at risk from white pine blister rust, native to Eurasia, which grows into the branches and stems, killing the branches, ending cone production, and ultimately killing the trees (Tomback et al. 2001, p. 3-21).

The effects of whitebark pine decline ripple throughout the ecosystem. Whitebark pine seeds represent a high energy food source of a sort not provided by the other conifers that dominate the subalpine forest. They are particularly important for grizzly bears and Clark's nutcrackers. The nutcrackers are key to widespread dispersal of the seeds, storing them in multiple caches across the forest, and leaving many of them to germinate to seedlings. Grizzly bears exert considerable effort in late summer and fall, ferreting out the caches, and in some areas, relying heavily on them as a pre-hibernation food source. The seeds are also consumed by a number of other seed-eating birds, rodents, and larger mammals—red crossbills, evening grosbeaks, mountain chickadees, Cassin's finches, red-breasted nuthatches, red squirrels, deer mice, yellow pine chipmunks, bushy-tailed woodrats, and black bears, among others (Tomback 2001, p. 89-104, Tomback and Kendall 2001, p. 243-262).

Local Whitebark Pine

In the Divide landscape, whitebark pine generally occupies sites above 6000 feet in elevation. Five-needle pines found below this elevation usually turn out to be limber pine, a similar species that can be difficult to differentiate from whitebark pine in the field in the absence of cones. While whitebark pine may occur as a dominant tree type, field surveys indicate that it almost always shows up as a minor component in stands dominated by lodgepole pine, subalpine fir, and Engelmann spruce. Whitebark pine on the HLCNF has been under attack from white pine blister rust for many decades and over the last 8 to 9 years, it has also suffered from mountain pine beetle infestation. Beetle-generated mortality in trees larger than 4-5 inches dbh has increased since these surveys were completed 8 years ago.

Whitebark pine is a relatively minor component of forest stands in the Tenmile – South Helena project area. This part of the Divide landscape does not contain the elevations and types of sites where whitebark pine would be most dominant. As a result, it is found almost entirely as a minor component—scattered seedlings, saplings, and mature trees—in stands dominated by other species, particularly lodgepole pine.

Over the last few years, with a majority of the larger trees succumbing to the mountain pine beetles, most remaining whitebark pine now occurs as understory seedlings and saplings. At the same time, however, most of the lodgepole pine overstory has also been killed by the beetles, providing an opportunity for the young whitebark pine to attain more rapid growth in the new “open” environment and temporarily free from most competition from other conifers.

Because whitebark pine has not been a prominent feature of subalpine forests in the project area, wildlife species that would normally depend on the pine either maintain lower populations than they would in whitebark pine dominated areas or they have adapted to using other seed and food sources. Clark’s nutcrackers are often observed in the project area, and while they undoubtedly focus on the whitebark pine seed source wherever it occurs, they have been obliged to diversify their diet. The same is true of red squirrels and other seed-eaters. Likewise, grizzly bears that can be highly dependent on whitebark pine seeds cached by the nutcrackers, have adapted to foraging in habitats other than whitebark pine stands in the project area [as has been shown to be the case in declining whitebark pine systems in the Greater Yellowstone Ecosystem]. The status of whitebark pine in the project area is discussed in more detail in the Forest Vegetation Report [Project Record].

Old Growth Conifer Forest

General Considerations

Old-growth forests are defined by the predominance of large, old-aged trees [see the Forest Vegetation Report for more detail on old-growth]. The structure of old-growth stands is variable, but in general, they are unique for their diversity and for the variety of niches that they offer. Old-growth is not a static end-point condition: old-growth stands are constantly evolving under the influence of insects, disease, fire, weather conditions, and inexorable aging processes. Particularly at higher elevations, old-growth stands are often eliminated by crown fire. While no local wildlife species are absolutely dependent on old-growth for their survival, a number of them find optimal conditions in these old forest environments. This includes the 2 Helena Forest Plan management indicator species for old-growth—the pileated woodpecker and northern goshawk.

In the Divide landscape, some old-growth occurs at lower elevation in warm/dry forest types (ponderosa pine and dry Douglas-fir). Historically, these old-growth stands were dominated by large, open-grown, fire-resistant trees with relatively “clean” grass/forb/shrub understories—a configuration maintained by frequent low intensity fires. With the advent of fire suppression in the 20th century, most of these stands became cluttered with dense understory trees and are now unlikely to survive fires of any magnitude. This old-growth configuration is rare in the project area.

At higher elevation, most old-growth occurs in moist forest types or on sites that retain snow for a longer period through the spring (moist Douglas-fir, Engelmann spruce, subalpine fir, lodgepole pine). Old-growth stands most often show multi-layered canopies, abundant woody debris, and varying age classes of snags. They support varied understory vegetation and maintain light and climatic variables that offer a diversity of wildlife niches (Franklin et al. 1981). Because stand-replacing fire is the norm here, this type of old growth usually occurs in blocks or patches of limited size—sites that have escaped catastrophic fire. These sites often occur in drainage bottoms and on north and east slopes and are typically dominated by subalpine fir and Engelmann spruce. Lodgepole pine stands may survive to old-growth status wherever conditions allow escape from stand-replacing fire for 150 years or more (Green et al. 1992, p.36). This is sometimes a fortuitous circumstance but it often occurs in rolling, high elevation terrain with poor drainage where snow remains through the spring. In spite of patchy distribution, old-growth stands, are usually surrounded by younger closed-canopied conifer stands, which thus creates a wider interior forest condition. These are the kinds of stands found in the project area.

The structural and vegetative diversity in these old-growth environments is notably greater than in most mature or pole-sized forest stands—particularly middle-aged lodgepole pine forests, which tend to be mostly single-storied with few snags and logs and with scant understory vegetation (or ground vegetation not particularly palatable as forage). As a result, old-growth forest tends to support a more complex wildlife community than the surrounding forest stands.

Project Area Old Growth

Old-growth in the project area has been identified by a combination of habitat modeling and field survey work that has specifically targeted old-growth habitat. The methodology used to define and identify these stands is discussed in detail in the Forest Vegetation Report. The overarching conclusion is that fully-developed old-growth is uncommon in the project area. This is a result of much of the area having been burned or logged in the latter 19th and early 20th centuries, leaving too little time for old-growth to have redeveloped. More recently, lodgepole pine old-growth has been obliterated over most of the area by the mountain pine beetle epidemic. Only stands in which most of the lodgepole canopy had been replaced by climax subalpine fir, Engelmann spruce, or Douglas-fir remain as old-growth environments.

Altogether, only 1,406 acres have been identified as viable, established old-growth. These and a number of mature stands that are approaching, but have not yet attained old-growth status, provide a complexity of microsites that support numerous wildlife species, including those dependent on dead-tree cavities, coarse woody debris, shaded mesic environments, multiple canopy layers, and diverse ground flora. Resident species include pileated woodpeckers, brown creepers, hermit thrushes, northern goshawks, western tanagers, white-breasted nuthatches, hairy woodpeckers, Stellar's jays, spruce grouse, red-backed voles, marten, red squirrels, golden-mantled ground squirrels, red-tailed chipmunks, and northern flying squirrels, among others. Native ungulates and black bears use these areas in summer for thermal cover to reduce heat stress. In winter these areas are important foraging and denning habitat for marten and also provide opportunities for snowshoe hares, wolverine, fisher, and lynx.

The Helena Forest Plan (HFP, p. II/20-21) directs that old-growth be assessed within 3rd order drainages, five of which are associated with the project area: Tenmile Creek (#1001-1), Minnehaha Creek (#1001-2), Walker Creek (#1001A), Buffalo Creek (#0814), and Nelson Gulch (#0909C). Two of the 3rd order drainages extend beyond the project area boundary: 1001A and 0809C. The Forest Vegetation Report provides additional detail on old growth in the project area.

Edges and Ecotones

An edge is an interface where forested country and open-country habitats meet. An ecotone is the zone on either side of the edge that is influenced by the in between contrasting vegetation types (Thomas 1979, p. 48). In some cases, edges are abrupt and the zone of influence—the ecotone—is very narrow, as where a clearcut meets dense interior forest. In other cases, ecotones consist of broad bands of habitat that are structural and vegetative hybrids of the two habitats on either side, as where relatively open-grown, younger forest forms a gradual transition from mature forest to open grassland. These zones often develop where forest is gradually colonizing the grassland.

Edges and ecotones are abundant and widespread throughout the project area. Some are induced edges (human-created edges) such as those between mature forest and sapling-dominated clearcuts or between forested habitat and the margins of road corridors. Others are inherent edges (natural edges) such as at the meeting of forest and grassland, aquatic and shoreline habitats, riparian zones and uplands, talus and forest. Still others represent hybrid situations as where ecotones created by conifers moving out into meadows are cut back to preserve the open habitat, or trees in a riparian transition zone are thinned. Recently, edges and ecotone habitats have expanded dramatically with the mountain pine beetle epidemic. Slopes that were once covered with unbroken mature forest are now broken up into a patchwork of dead, open-canopied lodgepole pine and denser, green non-pine stands. In stands where lodgepole and other conifer species are mixed, broad ecotone-like forest formations have developed, eventually blending into totally dead lodgepole in some areas and green interior forest in others.

Edges and ecotones often support a more diverse assemblage of wildlife species than either of the adjacent habitats alone. Field surveys throughout the Divide landscape (1992-2013) reveal that species typically found along edges and in ecotones include chipping sparrows, dark-eyed juncos, northern flickers, brown-headed cowbirds, Townsend's solitaires, red-eyed vireos, pygmy nuthatches, robins, calliope hummingbirds, Hammond's flycatchers, blue grouse, yellow pine chipmunks, cottontails, and snowshoe hares, among others. Edges and ecotones provide a pairing of cover and forage for species wary of human activity or of predators. Elk, deer, moose, black bears, bobcats, and mountain lions, among other species, often frequent edges.

Some kinds of forest edges also provide ideal habitat for nest parasites (brown-headed cowbirds) and predators that are able to reduce local populations of susceptible grassland and forest songbirds to a greater extent than within the core areas of either adjacent habitats (Reese and Rati 1988, p. 128, 131). Wildlife species adapted to edges are widespread and common in the project area and are becoming more so as edge and ecotone habitat proliferates in the aftermath of the mountain pine beetle outbreak.

Because edges add to both between-habitat structural diversity on the landscape and species diversity in the wildlife community, they are sometimes incorporated into an index used to gauge the overall diversity of a given landscape [see Thomas 1979, p. 53-58; Walker and Craighead 1997].

The treatment units in either action alternative would at first produce a considerable amount of new induced edge (Thomas 1979, p. 51), contrasting the open clearcut and partial cut units with adjacent stands, most of which would be dominated by standing dead trees. Over the next decade, as the dead trees topple, the edge condition would revert to one of “clean” ground cover in the cutting units vs. accumulated large woody debris in the untreated stands. Eventually, conifers would regenerate in both treated and untreated areas, but the stands of young lodgepole pine emerging through the woody debris would generally be thicker than those in the treatment units (which would be maintained at lower density through thinning). This future “edge” between thicker and thinner stands would not be particularly striking. As a general rule, wildlife density and diversity tend to be higher along forest edges than in the center of either adjoining habitat (Thomas 1979, p. 48-59), but in this case the adjoining habitats are unlikely to be different enough to generate a measurable edge effect.

Based on wildlife field observations throughout the Divide landscape over the past 20 years and the results of scientific research dealing with forest edges and ecotones, local wildlife species diversity and population density (particularly of birds) are expected to increase in the vicinity of treatment unit edges during the first several years after project completion. It is anticipated that the diversity would decline from this level once most of the dead trees on the untreated side of the edge have fallen, thus diminishing the structural contrast between the two habitats. There should be no meaningful negative impacts on any species of special concern that might be attributed to the presence of the edge.

Grasslands

Mountain grasslands (with and without shrubs) are widely distributed across the project area, but they are highly fragmented. These habitats occur at all elevations and on a variety of slopes and aspects. Most often, the grasslands are dominated by rough fescue, Idaho fescue, bluebunch wheatgrass, oatgrass, junegrass, sedges, and tufted hairgrass intermingled with a variety of forbs and low shrubs. Larger shrubs (big sagebrush, bitterbrush, chokecherry, shrubby cinquefoil) sometimes occur within the grasslands—in patches of various sizes or as scattered individuals—but they seldom dominate these grassland breaks in the forest continuum.

The grasslands, in spite of their relatively small contribution to the overall acreage of the project area and their fragmented dispersion, add an important element of diversity to the forest-dominated landscape. They are a primary source of inherent edge/ecotone habitat and they provide the primary grazing resource for elk and a number of other native grazers, large and small. Mountain grasslands serve as the base habitat for a number small mammals and birds—montane voles, pocket gophers, ground squirrels, badgers, long-tailed weasels, vesper sparrows, lark sparrows, mountain blue birds, kestrels, harriers, rough-winged swallows, nighthawks, chipping sparrows, horned larks, and white-crowned sparrows, among others. Other species, such as chipping sparrows,

juncos, robins, flickers, blue grouse, and snowshoe hares are common along the edges. A number of predators, while wide-ranging, focus the bulk of their hunting in the mountain grasslands—coyotes, red foxes, wolves, red-tailed hawks, Cooper’s hawks, sharp-shinned hawks, golden eagles, great gray owls.

While some of the montane grasslands in the project area are mesic environments (moderately well-watered), most are relatively dry. Nonetheless, they serve as productive foraging areas for native grazers in spring, summer, and fall. Elk usually begin moving through grasslands in the northern part of the project area in late April or early May, feeding on cured grasses from the previous year and zeroing in on areas of early green-up as they develop. They continue to focus most of their foraging in the grasslands through early summer, gradually shifting to wetland and riparian environments as the summer progresses. In fall, when much of the wetland vegetation succumbs to frost, the elk return to the drier grasslands, feeding on cured grasses and new fall green-up.

Beginning in the 19th century and continuing through much of the 20th century, the biggest threat to the integrity of mountain grasslands was overgrazing by domestic livestock (cattle, sheep, and horses). National Forest allotment management plans progressively reduced livestock numbers and employed rotation grazing systems in the latter decades of the 20th century to allow grassland recovery. With the exception of some sites where cattle still concentrate to the detriment of habitat (mostly in wetland and riparian areas), livestock grazing in most of the Divide landscape is now reduced to a point where forage available for native grazers is more than adequate and grassland vegetation is in reasonably good health (in terms of species composition, diversity, and productivity). Livestock have relatively little influence on project area grasslands.

Primary problems with montane grassland habitats today involve (1) the spread of noxious weeds and (2) colonization of grasslands by conifers from adjacent forest habitats.

Noxious Weeds

Noxious (or invasive) weeds are plants that have been imported into Montana from other areas (most often, Eurasia) over the last 200 years—and as a result, local ecosystems have not had the time to develop natural biological controls for them. Wherever suitable habitat conditions are available, noxious weeds are usually able to outcompete and displace many of the native plants that have evolved within a system that allows a variety of species to coexist (see Montana Noxious Weeds at montana.plant-life.org/page_weeds.htm). Many of these invasive weed species, if allowed to increase unchecked, are capable of developing veritable monocultures. Noxious weeds in the Divide landscape are associated primarily with unforested and open-forested sites or with breaks within the forest. Areas most at risk are those disturbed by humans (roadsides, motorized trails, harvest units, mining operations, camp sites), overgrazed grassland/shrubland, burned areas, and riparian areas.

The HLCNF has documented the presence of several State of Montana noxious weed species in the project area. The two most common are Canada thistle and spotted knapweed. Orange hawkweed and Dalmatian toadflax are also present but much less common. All of these species are currently being treated via the ongoing Forest Weed

Management Program, which is using both on-ground herbicide spraying and release of insects that prey upon specific weed species.

From a wildlife standpoint, invasive weeds are a problem in that they outcompete native forage plants, replacing them with unpalatable (and sometimes poisonous) species; they lower plant species diversity; and they create a new microclimate in which many small mammals and birds are less fit or in which they are unable to survive at all. Studies have shown that where Eurasian weeds supplant much of the native plant community, significant changes in bird species composition and abundance result (Scheiman et al. 2003; Wilson and Belcher 1989). While these impacts are most striking in plains ecosystems, they can also occur in mountain grasslands such as those in the project area. In Montana, invasive weeds have been a particular problem on big game winter ranges. A number of studies have documented a decline in the amount of forage available to elk where invasive species such as spotted knapweed have moved into native bunchgrass communities—in some cases, forcing elk and deer to abandon such ranges entirely (Bedunah 1992).

Some upland parks, riparian areas, old clearcuts, and roadsides where native grazers forage in summer have been hit by noxious weeds. To this point, the impact has not been severe enough to measurably alter the way that elk, deer, and other species use traditional habitat; and given the aggressive weed control program adopted by the HLCNF in recent years, it is most likely that the potential for such impacts will decline rather than increase in the future.

Big Game Species

White-tailed Deer

The white-tailed deer (*Odocoileus virginianus*) is the most widely distributed and abundant big game animal in North America. Whitetails are highly adaptable and make use of a variety of habitats, depending on what is available locally. In northwestern Montana they are closely associated with subclimax coniferous forest (Mundinger 1984); in the eastern and central parts of the state, they are dependent upon riparian forest (Foresman 2012, p. 390). On the HLCNF and in surrounding areas, they tend to concentrate in the valleys, river bottoms, agricultural fields, and in towns and subdivisions, leaving much of the upland habitat in the foothills and mountains to the mule deer. As a result, white-tailed deer are much less common in the project area than mule deer. They are most often seen in the major stream bottoms in the northern part of the project area.

Like mule deer, whitetails are broadly adapted to forest edge habitats, but because they focus on more succulent, higher quality foods, they tend to seek out moist habitats to a greater degree than mule deer (Mackie et al. 1998, p. 32-34). White-tailed deer deal well with a variety of habitat disturbances (fire, forest insect outbreaks, timber harvest, agricultural clearing)—a function of their preference for foraging in second-growth forest, shrubfields, edge, and cultivated crops. Whitetails spend much of the day in forest cover and move out into open habitats at dawn and dusk, sometimes foraging into the night (Foresman 2012, p. 390-391). Among other things, this behavior pattern allows them to minimize contact with humans. White-tailed deer make more use of forest cover

than mule deer in all seasons. Populations are highest when forested riparian areas are available, and in winter they retreat to forested thermal cover considerably more often than mule deer.

As with mule deer, white-tailed deer populations have recently declined across much of the state—although not entirely for the same reasons. Primary problems for white-tailed deer populations have been deep-snow winters in 2010 and 2011 and recent outbreaks of epizootic hemorrhagic disease (for which there is no effective treatment or control) (Halls 1978, p. 54). While the Fish and Game Commission has eliminated B-licenses for white-tailed deer in some parts of the state, the restrictions have not been as all-encompassing as with mule deer. In the 2 hunting districts connected to the project area—HD 215 and HD 335—the number and types of licenses for white-tailed deer have remained essentially unchanged [see Montana 2014 Hunting Regulations: <http://fwp.mt.gov/hunting/regulations>]. Whitetail populations are capable of recovering from shortfalls very rapidly, particularly in response to an increase in foraging habitat as occurs with timber harvest or fire or with an increase in food availability after a mild winter (Foresman 2012, p. 390).

Despite the differences between the two species, they are similar enough that habitat management strategies on the HLCNF and population management (hunting regulation) by MFWP are similar for both mule deer and white-tailed deer. Much of the previous discussion of “Mule Deer” is thus valid for whitetails as well.

Black Bear

The black bear (*Ursus americanus*) occurs in all forested regions of Montana and is more dependent on interior forest environments than are elk, deer, moose, or grizzly bears (Foresman 2012, p. 340-343). While black bears forage in forest habitats to a certain extent, they more often make use of them as sites for day beds, escape cover, screened travel routes, shade, and secure den sites (Jonkel 1978, p. 236-238). Like grizzlies, black bears are opportunistic omnivores, constantly on the move, switching from one food to another as availability dictates. They eat whatever animal matter they can kill or scavenge (rodents, elk calves, insects, carrion) but they rely most heavily on vegetation (green plant matter, roots, seeds, berries). The fact that they possess a short carnivore digestive tract means that they need to consume tremendous amounts of plant material to compensate for digestive inefficiency (Foresman 2012, p. 341). Because the foods they consume occur in a variety of habitat formations (forest, meadows, edges, riparian areas), black bears are particularly drawn to mixed forest environments with a variety of tree sizes, shrub species, small productive openings, and wet sites (Kolenosky and Strathearn 1987). While they tend to avoid new clearcuts and burns (except when on the move), they frequently forage in those areas once new vegetation and a modicum of cover develop (Jonkel and Cowan 1971, p. 20-21).

Black bears range through most parts of the project area on a regular basis from April into November, foraging in the more productive sites and making use of forest cover for day-beds, thermal relief, and general concealment. Bears usually begin denning/hibernating sometime in November, depending on the availability of autumn foods (Linnell et al. 2000). They can den in a variety of habitats but most often choose forest or dense shrub formations, taking advantage of large tree roots, logs, boulders, and

caves. Bears are not true hibernators and they can be roused from winter lethargy by human activity such as winter recreation, hunting, and logging operations. As a result, they typically select hibernating sites that are secluded from predictable human activity (Linnell et al. 2000).

MFWP does not conduct population censuses for black bears, but HLCNF wildlife surveys over the last several years have regularly encountered bear sign (scat, tracks, diggings, rub trees), as well as the bears themselves on occasion, suggesting that black bears are well represented throughout the project area. A 7-year study involving nearly 200 bears in northwest Montana (Jonkel and Cowan 1971) found that while reproductive rates were relatively low (less than 2 cubs per adult female every 2 years), mortality rates were also low, resulting in a fairly dense, stable population. Hunting mortality was also very low. While habitat in the project area is less productive than in northwest Montana—and population density is thus probably lower—the same balance of productivity and mortality factors is likely to be in play here as well, resulting in a stable population.

The action alternatives present a mixed bag for black bears. If the surrounding forest were dominated by live trees, the bears would typically exploit the enhanced forage supply in the treatment units near the forest edge; but with the forest now dominated by dead trees, their use patterns may be different. Within another 5 to 10 years the “forest edge” would be reduced to a juxtaposition of open grass/forb or open forest habitat in the treatment units and accumulated woody debris in the surrounding “forest”—and the contrast between habitats created by the action alternatives and untreated areas would be considerably less meaningful (until new forest regenerated). The degree to which black bears would use any of this habitat under these circumstances is uncertain. The project would generate local shifts in habitat use by black bears but it would not measurably affect population size or structure. Loss of forest cover would be partially offset by gains in foraging opportunity and mitigated by the abundance of cover in surrounding untreated forest.

Mountain Lion

The mountain lion (*Puma concolor*) is the largest felid (cat) in North America. While mountain lions are highly adaptable animals, capable of exploiting a broad spectrum of environmental conditions (Russell 1978), they tend to frequent forested habitats where they can move in on prey undetected and avoid humans (Foresman 2012, p. 282). Widespread distribution of tracks, scat, and other sign observed during wildlife field surveys indicates that lions are present throughout the project area. However, because of their low numbers, secretive and often nocturnal lifestyle, frequent use of hiding cover, and aversion to most human activity, they are seldom observed. Mountain lions range over large areas. A recent study in the Garnet Range, roughly 20 miles northwest of the project area, found average home ranges of 106 mi² for females and 265 mi² for males (Robinson and Desimone 2011, p. 22-24). There is considerable variation in home range size from one area to another, however, with smaller ranges reported in areas where prey is more plentiful (Lindzey 2003). Because lions are territorial and home range overlap is relatively small [33 percent for female ranges, 22 percent for male ranges in the Garnet study], population density remains low (Foresman 2012, p. 283-284).

Primary prey (mule deer and, to a lesser extent, white-tailed deer and elk) are relatively common throughout the project area, as are a number of small and mid-sized mammals that can serve as alternate prey in summer and fall (squirrels, hares, porcupines, foxes, mice, etc.). Stalking cover (shrubs, regenerating conifers, tree trunks, large deadfall, boulders), which helps the lions approach prey unseen, is widespread but erratically dispersed at present. Mountain lions will cross large openings (especially at night) and will go after prey in these habitats if opportunities present themselves (Williams et al. 1995; personal observation).

Hiding cover during the hunting season is less an issue for lions (in terms of their survival) than for other hunted species since virtually all lion hunters use hounds to locate and chase lions, ferreting them out of hiding places. Recent research in the nearby Garnet Range indicates that the primary factor influencing the health of mountain lion populations is hunting and how it is regulated. Forest cover or other aspects of habitat were not raised as significant factors (Robinson and DeSimone 2011). In recent years, the quota in combined hunting districts 318/335, which includes the project area, has been 8 lions—a quota which hunters have been able to meet consistently.

The action alternatives would eliminate ‘stalking cover’ in treatment units, particularly within regeneration harvest treatments, making it more difficult for lions to approach ungulates foraging in those initially open habitats. But, it would also open up opportunities for prey, both primary and alternate, that prefer the more open habitat and more robust ground vegetation. The size and configuration of new openings and open forest under the action alternatives are well within the range of open habitats normally tolerated by and often used by mountain lions. Increased forage in these units would attract deer and elk, as well as some smaller prey, which, under certain circumstances, would draw lions to the sites. Given the abundance of untreated forest habitat in surrounding areas, these new treatment units would have no significant effect on the ability of lions to continue to successfully inhabit the area.

Sensitive Species

Overview

Rationale for Assessment

Evaluation of “sensitive species” is a requirement of the National Forest Management Act (NFMA) of 1976. Sensitive species are native species whose populations may be vulnerable to viability problems trending toward their being listed under the Endangered Species Act. A current list of sensitive species in this area is maintained by USFS Region 1 (Northern Region) in Missoula—the most recent version having been issued in August 2013. The status of all threatened, endangered, and sensitive (TES) species and potential effects of the project are compiled in the Biological Evaluation section toward the end of this report.

Evaluation of sensitive species is also a requirement of the BLM. BLM Manual 6840 Special Status Species Management establishes the policy for management of the Bureau’s sensitive species found on BLM-administered lands. Sensitive species are designated by the State Director, usually in cooperation with the Montana Natural Heritage Program and other agencies responsible for managing species. A current list of

sensitive species is located in the Butte Resource Management Plan and Final Environmental Impact Statement (USDI BLM pp. 255-259).

Sensitive Species Present

The discussion in the sections that follow address sensitive species that inhabit the Divide landscape, focusing on the area south of U.S. Highway 12, where the project area is located. Also taken into consideration are the foothills and valley sites adjacent to the Forest boundary that may provide habitat for species within range of the project area. Six sensitive species on the Forest Service's sensitive species list that are present in the Divide landscape could be directly or indirectly affected by the project alternatives—although the potential is quite low in some cases. The 6 species are the northern Rocky Mountain gray wolf, the boreal toad, the fisher, the flammulated owl, the black-backed woodpecker, and the wolverine (discussed above). The flammulated owl and wolverine are analyzed in the Dry Forested Habitats section and the Wolverine section, respectively, above. The remaining species are discussed below under their respective heading.

BLM sensitive species that may be present in or adjacent to the project area include the 6 identified from the Forest Service's sensitive species list as well as the following: three-toed woodpeckers, Brewer's sparrow, spotted bat, and the northern goshawk. The three-toed woodpecker and northern goshawk are analyzed in the Snags and Down Woody Debris section and the Northern Goshawk section, respectively, above. The remaining species are discussed below under their respective heading.

Sensitive Species Not Present

Sensitive species that are resident elsewhere on the HLCNF or BLM but have been identified only as transients or not at all in the project area are the bighorn sheep, Townsend's big-eared bat, bald and golden eagle, peregrine falcon, and plains spadefoot toad. The northern bog lemming and harlequin duck are suspected to occur on the Forest, but have not been positively identified as present.

Bighorn sheep inhabited the Divide landscape historically but have not been present since the late 19th or early 20th century. The landscape harbors a certain amount of suitable habitat, but so far, MFWP has chosen not to reintroduce the sheep and none have migrated in from neighboring regions. Bighorn populations are at risk primarily from disease. Vegetation management issues for the sheep are similar to those for elk and deer—though on a more limited scale and in a different assortment of habitats.

The Townsend's big-eared bat has not been found in the project area or the Divide landscape. Bat surveys conducted on the Helena NF in recent years have found big-eared bats in the Big Belt Range to the east but not elsewhere on the Forest [Point Observation Database, Montana Natural Heritage Program (<http://mtnhp.org/tracker/HNTMap.aspx>)]. Removal of large decadent trees may reduce potential roosting sites, but the key habitat sites in caves and mine adits are essentially unaffected by vegetation management operations.

Northern bog lemming habitat is present but highly fragmented and uncommon. Bog lemmings may be present on the HLCNF but they have not yet been reported. The best habitat—involving classic sphagnum moss bogland—is on the Lincoln Ranger District

west of the Divide. Higher elevation wetland areas in the project area that might provide marginal habitat are, as far as can be determined, unoccupied. All such sites have been exempted from impactful project activity because soils, hydrology, and general wildlife habitat concerns.

Bald eagles are occasionally reported in the Divide landscape, but so far, only as transients. For several years a pair nested west of the Forest boundary along Snowshoe Creek, but these birds spent virtually all of their time along the lower Little Blackfoot River on private and State land. This nest is no longer active, but bald eagles are still regularly reported along the lower Little Blackfoot River several miles west of the Helena NF boundary. Potential nesting, roosting, and foraging habitat is available on the Forest, in particular, along the upper Little Blackfoot River in the southern part of the landscape. But so far, no eagles have chosen to occupy it. The Montana Bald Eagle Management Plan contains guidelines for forest management and human access around nest sites that would guide management if eagles were to establish themselves in this part of the Forest. Golden eagles are also occasionally reported in the vicinity of the project area. It's unlikely that golden eagles would become established in the project area due to a lack of suitable habitat. Golden eagles could however utilize the project area as an occasional foraging opportunity.

Peregrine falcons have been reported occasionally in the Divide landscape over the past 25 years—mostly in the vicinity of Mount Helena and around Sheep Mountain just east of the HLCNF boundary near Clancy. Most observations have been during the spring and fall migration periods, and no eyries are known to have been established. Since 1989, when the falcons returned to the HLCNF, all known eyries have been in the Big Belt Mountain Range. Management of these birds focuses on keeping recreationists off the cliffs where the eyries are established. Vegetation management is seldom an issue.

Harlequin ducks are suspected to be present on the Lincoln District of the HLCNF, but none have been reported in the Divide landscape. Only marginal habitat is present—mostly on the upper Little Blackfoot River. Harlequins have been reported on the lower Little Blackfoot during migration several miles west of the Forest boundary.

The plains spadefoot toad has been found only along the Missouri River below Meriwether Canyon in the Big Belt Mountains. Its range just barely edges onto the HLCNF in an area of grassland, shrubland, and savannah.

The leopard frog, once relatively common in and around the HLCNF, including much of the Divide landscape, has not been reported in this part of Montana in over 20 years. It has almost certainly been extirpated, probably as a result of global factors (increased ultra-violet radiation, global warming, spread of pathogenic chytrid fungus) in addition to local habitat change. Leopard frogs are still relatively common in parts of eastern Montana. Standard management for the common spotted frog and the boreal toad will take care of habitat needs for leopard frogs, if they are in fact still present.

Northern Rocky Mountain Gray Wolf

The northern Rocky Mountain gray wolf (*Canis lupus irremotus*) was listed as an “endangered” species in 1973. Since that time, populations in the northern Rockies have gradually increased via a combination of natural migration southward out of Canada and

active reintroduction into Yellowstone National Park and central Idaho. Almost all of the wolves identified in and around the Divide landscape over the past 25 years have been migrants from Canada, although in the last few years a few Idaho and Yellowstone wolves have turned up in this general area.

Currently, the wolf is classified as a “sensitive” species in USFS Region 1, having been removed from the Endangered Species list in Montana and Idaho by an Act of Congress in March 2011. The State of Montana classifies the wolf as a “game” animal and has maintained a general wolf hunting season since 2011 and a trapping season since 2012. The effect of these policies has been to flatten the steadily increasing state-wide population trend of the last several years. Montana’s wolf population was estimated to be 625 at the end of 2012; the estimate for 2013 was 627 (USDI FWS et al. 2014, p. 1). The 2013 estimate for the northern Rockies as a whole (Montana, Idaho, Wyoming) was 1,691 wolves (78 breeding pairs). The USFWS region-wide minimum recovery goal of 300 wolves (30 breeding pairs) has been met every year since 2002 (USDI FWS et al. 2014, p. 1).

The fact that wolf populations were continuing to increase prior to the initiation of shooting/hunting/ trapping programs indicates that habitat and population mechanisms had not yet kicked in as limiting factors. Wolves, for the most part, are habitat generalists that can successfully inhabit a broad range of environments as long as prey (mostly large herbivores), sufficient and secure denning and rendezvous sites are available for rearing young, and human-caused mortality is not too high (USDI FWS 1987, p. 7-11). Observation of wolf packs in the Divide landscape and in areas north and south of there over the past 20 years indicates that a habitat matrix that supports healthy populations of elk, deer, or moose can sustain a local wolf pack. The particular mix of forested and non-forested habitat is of little concern. Access routes that allow humans to approach and interfere with wolf dens or that make it easier for hunters to kill wolves are of more importance.

Currently, there are no radio-collared or otherwise marked wolves in or near the project area or elsewhere in the Divide landscape south of U.S. Highway 12. However, wolf activity is regularly reported in the vicinity of the project area as individuals continue to move southward through the Divide linkage zone and some of them group up to form local packs. The most consistent pack activity since 1995 has been in the Spotted Dog country along the west edge of the HLCNF and in the ranchland west of there. The Helmville-Avon Valley that runs north and south to the west of the Forest is a natural conduit for wolves, and they have been making use of it for the past 2 decades [see Sime 2010; Sime et al. 2007-2011; USDI FWS et al. 1996, 1997, 2003, 2006, 2010]

The most recent wolf activity of note in or near the project area was a possible pack of four to six wolves reported west of the project area in the Telegraph Creek drainage in 2012-2013 (Bradley et al. 2013, p. 18). This is in the same general area where the “Boulder pack”—the first viable pack on the HLCNF since the 1920s—was reported in 1995. That pack remained in the Telegraph drainage for a few weeks before moving southward onto the Beaverhead-Deerlodge NF. So, while the project area is known to provide suitable habitat for wolves, they typically range widely, taking advantage of opportunities over a much broader area [USDI FWS et al. 1996, 1997].

The habitat shift from standing dead forest to openings bereft of dead trees would have no meaningful implications for wolves. Potential prey use of the sites would increase, if anything. The new openings would not provide any real opportunity for hunters or trappers to improve their chances of bagging a wolf. If any denning or rendezvous site were located in the project area, project operations would be modified so as to stay well clear of the site until after midsummer when pups began moving with the pack. The project would have “no impact” on wolves.

Boreal Toad

The boreal toad is the Montana subspecies of the western toad, which is widely distributed in the Rocky Mountains and the Pacific Northwest. As with many amphibians, population numbers have been dwindling over the past two decades, leading to its listing as a sensitive species Region 1. Boreal toads are found most often in mountainous terrain—up to 9,220 ft. They are capable of breeding in the shallower reaches of any clean standing water ranging from roadside ditches to lakes (Werner et al. 2004, p. 73-74), but they generally prefer larger bodies of water than are often used by other local amphibians (G. Hokit, personal communication). Eggs are laid in May or June, depending on elevation, and tadpoles and young toads are present in and around aquatic sites through the summer. Adults are largely terrestrial and, outside of breeding season, may wander considerable distances from their aquatic breeding sites (Werner et al. 2004). They occupy a variety of terrestrial habitats irrespective of overstory cover. The quality of ground-level microhabitat is more important than large-scale vegetation structure. When not feeding, toads seek cover in rodent burrows, under logs, in dense vegetation and litter, or within any habitat structure that provides concealment from predators and protection from temperature extremes.

Primary local risk factors for boreal toads are those that affect breeding habitat via reduction in size and quality of riparian areas. Activities that eliminate key vegetation and increase water turbidity reduce the quality of riparian areas as breeding habitat. Specific problems include draining and alteration of aquatic habitat, proliferation of cattle in breeding sites, pollution, introduction of predatory fish, and roads and motor trails in riparian areas (Maxell and Hokit 1999). While toad populations are highest near aquatic sites, adult toads travel through a variety of upland habitats in summer. Timber and fuels projects that severely reduce logs and other woody debris can make cross-country travel more precarious for them; and while dense vegetation, burrows, and other components offer opportunities for shelter, the absence of deadfall can reduce local habitat opportunity.

Biologists from Carroll College in Helena have conducted systematic surveys and tallied boreal toads at numerous locations in recent years—including parts of the southern Divide landscape (G. Hokit, personal communication). Surveys have occasionally picked up boreal toads in upland habitats, but their relatively low densities in these areas and their tendency to burrow under cover make them difficult to discover.

None of the riparian areas in the treatment units maintains sufficient season-long surface water to serve as aquatic breeding habitat for boreal toads and support developing tadpoles and young toads. However, these wet sites could provide key habitat for any adults moving away from breeding sites through this area. Mitigation measures and

design elements intended to protect riparian areas would preserve the integrity of these sites as boreal toad habitat. Elsewhere, a sufficient amount of woody debris would be left on the ground to provide for nutrient recycling and to provide enough cover, when combined with ground cavities and robust ground vegetation to accommodate boreal toads in upland habitats. Within the next decade, logs and other large woody debris will provide abundant cover for toads everywhere else in the project area. Implementation of either action alternative “may impact individuals but would not likely result in a trend toward federal listing or threaten viability for the population or species”.

Fisher

The fisher (*Martes pennanti*) is an uncommon mid-sized forest carnivore tightly tied to mature forest habitats. It has been listed as a sensitive species in Forest Service Region 1 since the early 1990s. While reports of “fishers” in the Tenmile and adjacent drainages have come in on rare occasions over the past 20 years, none have been verified. Systematic hair snare and winter tracking surveys for fishers in the Divide landscape, 2007-2009, turned up no positive results. The project area is beyond the fringe of what the USFWS has determined to be the historic range of the fisher in North America (Federal Register: June 30, 2011; vol. 76, no. 126, p. 38509, 38513).

Fishers are strongly associated with older, structurally complex forest stands at mid-low elevation. Old-growth and mature riparian forests with a variety of snags, broken-top trees, and logs provide particularly good habitat. This type of habitat is severely limited in Divide landscape because of wildfire and logging patterns that eliminated much of the older forest in the late 19th and early 20th centuries. Most of the available forest consists of “travel” habitat that, while not providing long-term habitat for resident animals, allows them to move between key habitat sites under cover.

The action alternatives would modify some areas that may be considered suitable “travel” habitat between what few key habitat sites are present in the project area. Whether the standing dead trees and, eventually, the open-canopied deadfall in untreated areas would still be useful as travel habitat for fishers is not known, but it is unlikely. What is lowering the value of the project area and combination boundary as potential fisher habitat is the aftermath of the pine beetle outbreak, rather than the action alternatives. Implementation of either action alternative would have “no impact” on fishers.

Black-backed Woodpecker

The black-backed woodpecker (*Picoides arcticus*) is a primary cavity nester strongly associated with burned forests and associated wood-boring beetles. While it would seem that the bark beetle infested forests of the Divide landscape would provide an auspicious environment, black-backed woodpeckers do not appear to be taking advantage of it. Over the last 5 to 6 years, observations of other woodpeckers during field surveys have increased noticeably in these habitats—most obviously, hairy woodpeckers and northern flickers, but also some downy, pileated, and northern three-toed woodpeckers, as well as red-naped sapsuckers. In recent years, the only place in the Divide landscape where black-backed woodpeckers have been positively identified is the 170-acre MacDonald Pass burn, which originated in 2009. Elsewhere on the HLCNF, black-backed woodpeckers have been found in several burns in the Big Belt Mountains and on the

Lincoln Ranger District, but they have not been detected during 8 years of intensive bird survey work in beetle-impacted stands of the north Elkhorn Range (Avian Science Center 2006; Bate 2003, 2004, 2005, 2007; Mosher and Saab 2009, 2010, Dresser et al. 2012). In other parts of the west, black-backed woodpeckers have been reported in pine beetle-killed forests, sometimes in substantial numbers (Bonnot et al. 2008; USDA 2007e, p. 6). So, black-backed woodpeckers could well be present (and simply unobtrusive) in parts of the Divide impacted by the bark beetles—including the project area.

If the woodpeckers are in fact present, the action alternatives would promptly remove 4,001 acres in alternative 2 through regeneration harvest and 2,450 in alternative 3. In the absence of the action alternatives, this loss of habitat would occur more gradually. The loss would be mitigated in either case by the degree to which beetle populations decline after the trees have died. Burned trees generally dry out and lose their ability to support the wood-boring beetles on which the woodpeckers primarily feed in 4 to 8 years [see USDA 2007e, p. 3-4]. Bark beetles (such as mountain pine beetle) are generally present for only 1 to 2 years after they have attacked a tree: the dead trees may then support wood-boring beetles for another 2 to 3 years (Hagle et al. 2003). Implications for the project are that since most of the trees in the project area will have been dead for roughly 4 to 7 years by the time they are harvested, they will be near or beyond their utility as feeding substrate for black-backed woodpeckers. Another factor that would come into play is the abundance of standing dead trees that would remain intact in surrounding untreated areas in the project area. These would be sufficient to provide for any black-backed woodpeckers present. The project would have “no impact” on black-backed woodpeckers.

Brewer's Sparrow

The Brewer's sparrow typically breeds in shrub-steppe habitats dominated by sagebrush. Densities of Brewer's Sparrow correlated with some aspect of total shrub cover (Rotenberry et al. 1999). They generally preferred unburned to burned sagebrush. As described in the Grasslands section, larger shrubs including big sagebrush sometimes occur within the grasslands—in patches of various sizes or as scattered individuals—but they seldom dominate these grassland breaks in the forest continuum. Because of an overall lack of habitat, the action alternatives should not affect Brewer's sparrows.

Spotted Bat

Spotted bats generally inhabit open arid habitats dominated by sagebrush. At times they will utilize sagebrush communities intermixed with limber pine or Douglas-fir, or in grassy meadow savannahs (Hendricks and Carlson 2001). Spotted bats roost in caves, and in cracks and crevices of cliffs and canyons. Little is known of the abundance, reproductive biology, and habitat requirements of spotted bats in Montana. However, its preferred roosting habitat – i.e. caves – provides spotted bats with protection from many kinds of disturbance. There are no known caves in the project area; as such, the action alternatives should have no impact on spotted bats.

Biological Evaluation

Biological Evaluations are documented Forest Service reviews of the potential effects of proposed actions on threatened, endangered, and sensitive (TES) species (FSM Ch. 2670,

Amend. 2600-2005-1). These species groups are designated and managed under two different authorities. “Threatened” and “endangered” species (as well as those “proposed” as such) are listed under the Endangered Species Act (1973) and are overseen by the U.S. Fish and Wildlife Service. “Sensitive” species are a matter of Forest Service policy: they are designated by Regional Foresters based on population viability concerns—which may be evidenced by significant downward trends in population numbers, population density, or habitat capability (FSM Ch. 2670, Amend. 2600-2005-1, p. 12).

The biological evaluation of terrestrial wildlife species for the project occurs throughout the body of this report wherever the different species of concern are addressed. These include in detail two threatened species (lynx and grizzly bear) and one sensitive species (wolverine). The remaining species are discussed within the respective habitat section (e.g. flammulated owls are discussed in the Dry Forested Habitat section), briefly discussed in the Topics not Analyzed in Detail section or are not present in the project area. Table 155 summarizes the key aspects of the evaluation.

Table 155. Forest Service threatened and sensitive species in the project area

Species	Category	Status
Grizzly Bear	Listed threatened	A small number of grizzlies range through and inhabit the project area. Observations of bears and encounters between bears and humans are uncommon. Enough back-country, non-motorized habitat is available to support a small sub-population of bears over the long term. All action alternatives would affect grizzly bears to one degree or another.
Canada Lynx	Listed threatened	Lynx are known to occur in the project area—having been systematically tracked both north and south of Highway 12. Numbers are very low and, to date, no evidence of breeding has been noted. The bulk of the foraging habitat used by these animals has been in early seral conifer stands rather than in older multi-storied forest. The action alternatives would result in the removal of key lynx habitat – stand initiation and multistory hare habitat within the wildland urban interface.
Wolverine	Sensitive	Wolverines are known to inhabit the project area in very low numbers. They range widely through a variety of habitats. In winter they often frequent the same mix of early seral and mature forest as lynx. No active natal denning sites have been identified and no breeding noted. All action alternatives would potentially displace wolverines at least while project activities are ongoing.
Gray Wolf	Sensitive	Wolves pass through the project area regularly. Since 1995, several packs have been active in and around the landscape—most having reduced or removed after preying on local livestock. Currently no packs are known to be active in the landscape. The action alternatives would not affect the ability of wolves to utilize the project area.
Fisher	Sensitive	Fishers have not been reported in the project area, and only one report has been verified in the last 20 years for the Divide landscape as a whole. Key habitat is limited and patchy. The action alternatives would not affect fisher since the project is considered at the fringe of the fisher's historical range.
Townsend's Big-eared Bat	Sensitive	Big-eared bats have not been identified in the project area. The action alternatives would have no effect on key habitat components for these bats or on the bats themselves should they be present.

Species	Category	Status
Northern Bog Lemming	Sensitive	Northern bog lemmings have not been identified in the project area. Primary habitat (sphagnum bog mat) is rare and highly fragmented. The action alternatives would have no effect on it.
Bighorn Sheep	Sensitive	Bighorn sheep are not present in the project area. Potential habitat is somewhat fragmented, but sufficient to support a small population should the sheep be reintroduced or migrate in naturally in the future. The action alternatives would do nothing to erode this potential.
Black-backed Woodpecker	Sensitive	Black-backed woodpeckers focus on aggregations of fire-killed trees. They have not been identified in stands impacted by mountain pine beetle, such as those that now dominate broad areas of the landscape. The action alternatives would have no direct or indirect effects on these woodpeckers.
Flammulated Owl	Sensitive	Flammulated owls nest and forage in open-grown stands of large ponderosa pine which are very rare in the project area. The action alternatives are designed to promote large tree growth in Douglas-fir stands and to promote ponderosa pine where it occurs. All large snags would be retained (except where they pose a safety hazard). It's unlikely the action alternatives would impact flammulated owl habitat.
Peregrine Falcon	Sensitive	Peregrine falcons have never been documented nesting in the project area. The action alternatives would have no impact on their ability to do so in the future.
Bald Eagle	Sensitive	Bald eagles fly over and occasionally stop off in the vicinity of the project area—perching in large trees, most often near aquatic habitats. No nests have been identified. The action alternatives would have no impact on bald eagles or their key habitat components.
Harlequin Duck	Sensitive	Harlequin ducks have never been identified in the project area. Marginal habitat exists in parts of the upper Little Blackfoot but, so far, it has been unoccupied. The action alternatives would have no impact on it.
Boreal Toad	Sensitive	Boreal toads breed in aquatic habitats across the Divide landscape although none have been observed in the project area. Adults range widely through the uplands. Although populations have declined from historic levels, they seem to be holding up well in this area. The action alternatives are designed to avoid wetlands and riparian habitats so the only anticipated impact to toads is the potential for mortality associated with equipment needed for project implementation. This would be rare though.
Leopard Frog	Sensitive	Leopard frogs have not been identified in the project area in nearly 25 years and it is highly unlikely that they are still present. The action alternatives would not impact leopard frogs.
Plains Spadefoot Toad	Sensitive	On the Helena NF, the plains spadefoot has identified only in a small pocket of the northern Big Belt Range. Given their habitat preferences, it is highly unlikely that they are present anywhere in the project area. The action alternatives would not impact the Plains Spadefoot toad.

Table 156 presents the determination of “effects” (for T&E species) and “impacts” (for sensitive species). For most species, the action alternatives would have no measurable impact—either because the species are basically not influenced by project activities or because they are not present in the project area (or present so fleetingly that any effects would be imperceptible).

Table 156. Effects determinations for Forest Service threatened and sensitive species in the project area

Species	Effects / Impacts of Alternatives		
	Alternative 1	Alternative 2	Alternative 3
Grizzly Bear	No effect	May affect not likely to adversely affect	May affect not likely to adversely affect
Canada Lynx	No effect	May affect likely to adversely affect	May affect likely to adversely affect
Wolverine	No effect	May impact individuals but won't cause a trend towards listing or threaten species viability	May impact individuals but won't cause a trend towards listing or threaten species viability
Gray Wolf	No impact	No impact	No impact
Fisher	No impact	No impact	No impact
Townsend's Big-eared Bat	No impact	No impact	No impact
Northern Bog Lemming	No impact	No impact	No impact
Bighorn Sheep	No impact	No impact	No impact
Black-backed Woodpecker	No impact	No impact	No impact
Flammulated Owl	No impact	No impact May impact individuals but won't cause a trend towards listing or threaten species viability	May impact individuals but won't cause a trend towards listing or threaten species viability
Peregrine Falcon	No impact	No impact	No impact
Bald Eagle	No impact	No impact	No impact
Harlequin Duck	No impact	No impact	No impact
Boreal Toad	No impact	May impact individuals but won't cause a trend towards listing or threaten species viability	May impact individuals but won't cause a trend towards listing or threaten species viability
Leopard Frog	No impact	No impact	No impact
Plains Spadefoot Toad	No impact	No impact	No impact

Administration of BLM Sensitive Species

BLM Manual 6840 Special Status Species Management establishes the policy for management of the Bureau's sensitive species found on BLM-administered lands.

Similar to Forest Service sensitive species policy, the BLM is directed to minimize or eliminate threats affected sensitive species by:

- Determining, to the extent practicable, the distribution, abundance, population condition, current threats, and habitat needs for sensitive species, and evaluating the significance of BLM-administered lands and actions undertaken by the BLM in conserving those species.
- Ensuring that BLM activities affecting Bureau sensitive species are carried out in a way that is consistent with its objectives for managing those species and their habitats at the appropriate spatial scale.
- Monitoring populations and habitats of Bureau sensitive species to determine whether species management objectives are being met.

The evaluation of the BLM's sensitive wildlife species for the project is the same as that described above under the Biological Evaluation section for the Forest Service – i.e. the analysis occurs throughout the body of this report wherever the different species of concern are addressed. These include in detail two threatened species (lynx and grizzly bear) and one sensitive species (wolverine). The remaining species are discussed within the respective habitat section (e.g. flammulated owls are discussed in the Dry Forested Habitat section), briefly discussed in the Topics not Analyzed in Detail section or are not present in the project area.

The BLM sensitive species list is derived from the Butte Resource Management Plan and Environmental Impact Statement (USDI BLM 2008, pp. 255-259). That sensitive species list was further refined through the Montana Natural Heritage Program Map Viewer and availability of habitat. Many of the BLM sensitive species are also on the Forest Service sensitive species list for the project. Table 157 summarizes the status of the BLM sensitive species in the project area. For those species that are also on the Forest Service sensitive species list, reference is made to the analysis in the Biological Evaluation section.

Table 157. BLM threatened and sensitive species in the project area

Species	Category	Status
Grizzly Bear	Listed threatened	See Table 155
Canada Lynx	Listed threatened	See Table 155
Wolverine	Sensitive	See Table 155
Gray Wolf	Sensitive	See Table 155
Fisher	Sensitive	See Table 155
Townsend's Big-eared Bat	Sensitive	See Table 155

Species	Category	Status
Spotted Bat	Sensitive	Roosts in arid habitats with cliffs and crevices and forages over meadows, wet-lands, and water bodies. The species has been identified to the northeast of the project area in the Helena Valley. The action alternatives would have no impact on the species or their key habitat components.
Bald Eagle	Sensitive	See Table 155
Black-backed Woodpecker	Sensitive	See Table 155
Brewer's Sparrow	Sensitive	Habitat includes short-grass prairie with scattered or abundant sagebrush, or other arid shrub habitats. The species has been documented to the north of the project area in the Helena valley. The action alternatives would have minimal impact on the species or their key habitat components since sagebrush and other arid shrubs are limited in the project area.
Flammulated Owl	Sensitive	See Table 155
Golden Eagle	Sensitive	Prefers open habitats and nests on cliffs or large trees. The species has been documented adjacent to the project area. The action alternatives would have no impact on the species or their key habitat components.
Northern Goshawk	Sensitive	Nests in mature to old-growth conifer and aspen forest. Goshawks have been identified in the project area. The project would affect goshawk habitat to some extent although design elements are in place to protect nesting birds.
Peregrine Falcon	Sensitive	See Table 155
Three-toed Woodpecker	Sensitive	Breeds and forages in conifer forests with high incidence of insect infestation from fire, disease, or wind throw. The species has been documented in the project area. The action alternatives would have no impact on the species or their key habitat components.
Boreal Toad	Sensitive	See Table 155
Leopard Frog	Sensitive	See Table 155
Plains Spadefoot Toad	Sensitive	See Table 155
¹ BLM sensitive species not in the project area (on BLM-administered lands) include: black-tailed prairie dog, fringed myotis, fringe-tailed myotis, Great Basin pocket mouse, long-eared myotis, long-legged myotis, northern bog lemming, northern myotis, pallid bat, swift fox, western spotted skunk, white-tailed prairie dog, Baird's sparrow, black tern, blue-gray gnatcatcher, burrowing owl, chestnut-collared longspur, common loon, dickcissel, ferruginous hawk, Franklin's gull, great gray owl, greater sage grouse, harlequin duck, Le Conte's sparrow, loggerhead shrike, long-billed curlew, marbled godwit, McCown's longspur, mountain plover, Nelson's sparrow, red-headed woodpecker, sage sparrow, sage thrasher, sedge wren, Sprague's pipit, Swainson's hawk, trumpeter swan, white-faced ibis, willet, Wilson's phalarope, yellow rail, snapping turtle, spiny softshell turtle, greater short-horned lizard, milksnake, hog-nosed snake, Great Plains toad, and the Coeur d' Alene salamander		

Sensitive Plants

Introduction

The purposes of the Tennmile – South Helena Project are to improve conditions for public and firefighter safety across the landscape in the event of a wildfire and to maintain consistent quantity and quality of water within the municipal watershed. In order to achieve these purposes, there is a need to create a mosaic of vegetation and fuel structure more resilient to disturbance which would provide for safer, more effective fire suppression actions. Reducing intensity of wildfires and increased fire suppression effectiveness would improve protection measures for the surrounding communities and key municipal watershed infrastructure. These actions would reduce the probability of post-wildfire watershed impacts in the Tennmile municipal watershed. In addition, sources of anthropogenic sediment to streams need to be addressed in order to improve water quality, watershed function, and other resource values in the project area.

This section discusses the affected environment and environmental consequences of the proposed activities on botanical resources for the Tennmile - South Helena Project. There are no federally listed threatened, endangered, or proposed plant species known to occur on the Helena and Lewis & Clark National Forests (HLCNF) (USDI 2015) or on the Bureau of Land Management (BLM) Butte Field Office managed lands (BLM 2015), or suspected in the project area. Whitebark pine is a federal candidate species and is also a Region 1 sensitive species. With no effects expected for federally listed plants, this report is limited to Region 1 Forest Service and BLM Butte Field Office sensitive species and their habitats.

Sensitive species in the Northern Region of the Forest Service are those plant and animal species identified by the Regional Forester for which population viability is a concern. Viability concern is evidenced by (1) substantial current or predicted downward trends in population numbers or density and/or (2) substantial current or predicted downward trends in habitat capability that would reduce a species' existing distribution (Reel et al. 1989). The Forest Service has established direction in Forest Service Manual 2600 – Fish, Wildlife, and Sensitive Plant Habitat Management (USDA 2005) to guide habitat management for proposed, endangered, threatened, and sensitive plant species. This direction establishes the process prepared as the sensitive plant biological evaluation for the Tennmile - South Helena Project.

Assumptions

The following assumptions were used:

- The sensitive species list and descriptions of HLCNF and BLM Butte Field Office sensitive plant species are valid and were used for the analysis.
- Species on the Regional Forester's Sensitive Species List that occur on or are suspected to occur on the HLCNF have been identified.
- Geographic information systems combined with habitat information, on-the-ground experience and past surveys are useful to screen areas of low probability of species occurrence.

- Reconnaissance of representative habitats is appropriate to determine the presence of sensitive plant populations.
- The effects of past activities are represented in the current condition of sensitive plant occurrences and habitats.
- Monitoring data useful for establishing trends of the Hall's rush populations in the project area is lacking. Trends are assumed to be stable for this species.
- Whitebark pine is reported to be in decline. With a lack of action, this trend is assumed to continue. With appropriate actions, including treatments proposed as a part of this project, it is plausible that the downward trend would discontinue, and even possibly reverse, in the treated areas.
- Standard buffers for riparian and wetland areas are assumed to be appropriate for protection of sensitive plant species that occur in these habitats.
- Natural disturbances including wildfire, floods, storm damage, and others are likely to occur in the future.

Information Used

The Montana Natural Heritage Program (MTNHP) maintains a statewide database for species of concern, including Region 1 Forest Service and BLM Butte Field Office sensitive plant species (MTNHP 2015). Data from the MTNHP, BLM Butte Field Office staff, and Helena NF sensitive plant program were used for known sensitive plant populations. Numerous other surveys and inventories have been conducted across the Forest over the past 20+ years including: FIA intensified grid data plots, which are intensive inventory plots where data collectors search for and identify sensitive plant species (see project record for detailed information on FIA intensified grid data collection procedures); roadside surveys associated with noxious weed infestations (Barton and Crispin 2002); wetland surveys contracted through the MTNHP; PACFISH/INFISH Biological Opinion plot inventory; and field survey crew inventories. Negative survey information was used to identify areas that do not support sensitive plant habitat. Information on negative surveys can be found in the project record. Only the species on the sensitive species list that are known or suspected to occur on the Helena National Forest are included in specific species surveys.

General reconnaissance surveys by the appropriate field crews would be conducted in the project area prior to the final decision. Past surveys by the MTNHP (Barton and Crispin 2002) as well as past surveys by the forest survey crews would be used to focus the survey work.

Methodology

The methodology used in this analysis includes overlay and interpretation of the best available data from several geospatial datasets including Montana Natural Heritage Program occurrence and predictive model data, aerial imagery, vegetation, soils (USDA 2001), maps, as well as the current project's proposed areas of activity and others. Known occurrences are mapped and available in GIS. Any mapped data contains some inherent error, and these errors affect the accuracy of the analysis results.

A literature review has been completed of available information on sensitive plant species, habitat and disturbance process effects on flora (Barton and Crispin 2002; Brown et al. 2000; Chadde et al. 1998; Cooper et al. 2005; Montana Natural Heritage Program, Plant Species of Concern Database (MTNHP 2015); Nock 2008; Poole and Heidel 1993; Reel et al. 1989; St.Hilaire 2002; USDA 2006).

Sensitive Plants, Affected Environment

Introduction

Sensitive species in the Northern Region of the Forest Service are those plant and animal species identified by the Regional Forester for which population viability is a concern. Because the proposed activities have potential to negatively affect sensitive plants, these effects were evaluated using the following indicators and measures useful in comparing differences between alternatives. These indicators are presented separately for each alternative in their respective sections and combined in the conclusions.

Table 158. Sensitive Plant resource indicators and units of measure.

Resource Indicator	Qualitative Units of Measure	Quantitative Units of Measure
Abundance	Presence or absence	Number of populations and/or plants affected
Suitable habitat	Presence or absence (based on habitat type and site conditions encountered during surveys)	
Species Viability	Determination category	

Determination Categories

This biological evaluation reviews the proposed action and alternatives in sufficient detail to determine the level of effect that would occur to Region 1 Sensitive plant species. One of four possible determinations is chosen based on the best available scientific literature, a thorough analysis of the potential effects of the project, and the professional judgment of the botanist who completed the evaluation. The four possible determinations are:

- “No impact”
- “Beneficial impact”
- “May impact individuals or habitat, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species”
- “Will impact individuals or habitat with a consequence that the action may contribute to a trend towards federal listing or cause a loss of viability to the population or species”.

Analysis Area

The Tennile – South Helena project area was used as the analysis area for direct and indirect effects on individual populations. The project area is an appropriate size to assess the effects of proposed actions because all potential disturbances and effects to sensitive plants would occur within this boundary. This analysis assumes that the existing

condition includes the effects of past actions and considers effects 10 to 20 years into the future, which allows adequate time to observe changes in vegetation.

The cumulative effects analysis area is the Helena National Forest, as effects on plant populations throughout the Forest are considered in determining potential impacts to the overall population.

Species Evaluated

The following Northern Region Forest Service and BLM Butte Field Office sensitive plant species are known or suspected to occur on the HLCNF and were evaluated for more specific habitat presence in the Tenmile – South Helena Project area.

Table 159. Sensitive plant species evaluated.

Species (Family) Common Name	Habitat	Known to occur on HLCNF or BLM?	Known to occur in the project area?	Likelihood of occurrence in Tenmile – South Helena Project area
<i>Adoxa moschatellina</i> (Adoxaceae) Muskroot	Vernally moist places at the bottom of undisturbed, open rock slides with cold air drainage; montane.	No	No	Unlikely – Known from the Little Belt Mountains and Divide area. Habitat is not generally subject to human disturbance or invasive weeds.
<i>Amerorchis rotundifolia</i> (Orchidaceae) Round-leaved orchis	Spruce forest around seeps or along streams, often in soil derived from limestone.	No	No	Unlikely – Known from the Rocky Mountain Front and the northwest corner of Montana. Geographically unlikely to occur.
<i>Aquilegia brevistyla</i> (Ranunculaceae) Short-styled columbine	Open woods and stream banks at mid-elevations	No	No	Unlikely – In Montana, it is known only from the Little Belt Mountains. Geographically unlikely to occur.
<i>Aquilegia formosa</i> (Ranunculaceae) Sitka columbine	Moist soil of open coniferous, cottonwood, or aspen forests in the montane to subalpine zone.	No	No	Unlikely - Known from a few locations in southwestern Montana. Geographically unlikely to occur.
<i>Astragalus lackschewitzii</i> (Fabaceae) Lackschewitz' milkvetch	Open, gravelly, calcareous soil and talus on ridge tops and slopes in alpine or subalpine zones.	No	No	Unlikely – Restricted to high elevation gravelly and rocky slopes and ridges, habitat that is not generally subject to human disturbance.
<i>Astragalus convallarius</i> var. <i>convallarius</i> (Fabaceae) Lesser rushy milkvetch	Grasslands, sagebrush steppe, and open ponderosa pine woodlands.	No	No	Unlikely – Habitat for this species is not present in the project treatment units.
<i>Boechera fecunda</i> (Brassicaceae) Sapphire rockcress	Rocky, calcareous soil of open slopes in grassland, steppe, woodlands, and open forest	No	No	Unlikely - Endemic to Ravalli, Beaverhead, and Silver Bow counties of Montana. Geographically unlikely to occur.

Species (Family) Common Name	Habitat	Known to occur on HLCNF or BLM?	Known to occur in the project area?	Likelihood of occurrence in Tenmile – South Helena Project area
<i>Botrychium crenulatum</i> (Ophioglossaceae) Wavy moonwort	Various mesic sites from low to moderate elevations, including roadsides and other disturbed habitats. Sites may be partially shaded or open.	No	No	Possible – Known from the Beaverhead-Deerlodge National Forest and in western Montana, this species generally occurs in wet habitats with high ground cover. The project area contains wet habitats and previously disturbed areas.
<i>Botrychium paradoxum</i> (Ophioglossaceae) Peculiar moonwort	Mesic meadows associated with spruce and lodgepole pine forests in the montane and subalpine zones; also found in springy western red cedar forests.	Yes	Yes	Known – This species is known from the Occidental Plateau area and near Irish Mine Hill on the HLCNF in sagebrush/rough fescue and rough fescue habitats.
<i>Carex idaho</i> (Cyperaceae) Idaho sedge	Moist alkaline meadows, often on stream terraces.	No	No	Unlikely – Known from southwestern Montana. Geographically unlikely to occur.
<i>Cypripedium parviflorum</i> (Orchidaceae) Small yellow lady's slipper	Fens, damp mossy woods, seepage areas, and moist forest-meadow ecotones in the valley to lower montane zones.	Yes, at least very close	No	Unlikely – One occurrence is mapped very close to the Helena National Forest near Helena, but the site has not been relocated since 1891.
<i>Cypripedium passerinum</i> (Orchidaceae) Sparrow's-egg lady's slipper	Mossy, moist, or seepy places in coniferous forests, often on calcareous substrates.	No	No	Unlikely – This species occurs in northwestern Montana, including Glacier National Park. Geographically unlikely to occur.
<i>Drosera anglica</i> (Droseraceae) English sundew	With sphagnum moss in wet, organic soils of fens in the montane zone.	Yes	No	Unlikely – Known from Indian Meadows, in specialized fen habitat. Specialized fen habitats are not known to occur in the project area.
<i>Drosera linearis</i> (Droseraceae) Slenderleaf sundew	Wet, organic soil of nutrient-poor fens in the montane zone.	Yes	No	Unlikely – Known from Indian Meadows, in specialized fen habitat. Specialized fen habitats are not known to occur in the project area.
<i>Epipactis gigantea</i> (Orchidaceae) Giant helleborine	Stream banks, lake margins, fens with springs and seeps, often near thermal waters.	No	No	Unlikely – This species is typically associated with thermal seeps and springs. Thermal waters are not present in the project area.
<i>Erigeron linearis</i> (Asteraceae) Linearleaf fleabane	Dry, stony soil of sagebrush steppe and grasslands	No	No	Unlikely – Habitat for this species is not present in the project treatment units.

Species (Family) Common Name	Habitat	Known to occur on HLCNF or BLM?	Known to occur in the project area?	Likelihood of occurrence in Tenmile – South Helena Project area
<i>Goodyera repens</i> (Orchidaceae) Northern rattlesnake- plantain	North-facing, mossy forested slopes in the montane zone.	No	No	Unlikely - Known from the Little Belt and Big Snowy Mountains. Geographically unlikely to occur.
<i>Grindelia howellii</i> (Asteraceae) Howell's gumweed	Vernally moist, lightly disturbed soil adjacent to ponds and marshes, as well as similar human-created habitats, such as roadsides and grazed pastures. Known sites in Montana range from 3,000 to 4,800 feet in elevation.	No	No	Unlikely - This species is an endemic known only from a cluster of sites northeast of Missoula, and a single county in Idaho. Geographically unlikely to occur.
<i>Hornungia procumbens</i> (Brassicaceae) Hutchinsia	Vernally moist alkaline soil of sagebrush steppe.	No	No	Unlikely – Habitat for this species is not present in the project treatment units.
<i>Juncus hallii</i> (Juncaceae) Hall's rush	Subalpine parklands and moist meadows and slopes in the montane zone.	Yes	Yes	Known – Multiple populations occur on the Helena National Forest. There are two occurrences within the project area and a total of 9 populations within the combo boundary.
<i>Mimulus nanus</i> (Phrymaceae) Dwarf purple monkeyflower	Dry, open, often gravelly or sandy slopes in the valleys and foothills.	No	No	Unlikely – Known only from a few extent occurrences in MT. Habitat for this species is not present in the project treatment units.
<i>Oxytropis podocarpa</i> (Fabaceae) Stalkpod locoweed	Gravelly ridges and slopes, often on limestone, in the alpine zone.	No	No	Unlikely – Restricted to high elevation gravelly slopes and ridges, habitat that is not generally subject to human disturbance.
<i>Penstemon lemhiensis</i> (Plantaginaceae) Lemhi beardtongue	Sparsely vegetated soils of grasslands, sagebrush steppe, and open forest, or roadbanks.	No	No	Unlikely – Endemic to Beaverhead, Deer Lodge, Ravalli, and Silverbow counties of MT. Geographically unlikely to occur.
<i>Phlox kelseyi</i> var. <i>missoulensis</i> (Polemoniaceae) Missoula phlox	Open, exposed, limestone-derived slopes in the foothills to exposed ridges in the subalpine zone.	Yes	No	Known – This species is known to occur on open slopes near MacDonald Pass.
<i>Pinus albicaulis</i> (Pinaceae) Whitebark pine	Subalpine and krummholtz habitats in most mountain ranges.	Yes	Yes	Known – Whitebark pine occurs in mixed stands at the higher elevations in the project area.

Species (Family) Common Name	Habitat	Known to occur on HLCNF or BLM?	Known to occur in the project area?	Likelihood of occurrence in Tenmile – South Helena Project area
<i>Polygonum douglasii</i> ssp. <i>austiniae</i> (Polygonaceae) Austin knotweed	Gravelly, often shale-derived soil of open slopes and banks in the montane zone. This species has been found on loose talus slopes in the Big Belts.	Yes	No	Possible – Mainly known from the Big Belts landscape. MTNHP shows occurrences present in all directions from the project area.
<i>Primula incana</i> (Primulaceae)	Moist to wet, alkaline meadows.	No	No	Unlikely - Habitat for this species is not present in the project treatment units.
<i>Saxifraga tempestiva</i> (Saxifragaceae) Storm saxifrage	Vernally moist, open soil in meadows and on rock ledges in the subalpine and alpine zones. Elevations range from 7,920 to 9,900 feet.	No	No	Unlikely – Montana endemic known only from high elevations, west of the continental divide. The known elevation range for this species is above those in the project area.
<i>Schoenoplectus subterminalis</i> (Cyperaceae) Water bulrush	Open water and boggy margins of ponds, lakes, and sloughs at 0.1-3 m depth in the valley, foothill, and montane zones.	Yes	No	Unlikely – Known from Indian Meadows, and sites in NW Montana, primarily west of the Continental Divide.
<i>Thalictrum alpinum</i> (Ranunculaceae) Alpine meadowrue	Alpine meadowrue typically grows in moist montane and lower subalpine areas. In southwestern Montana, it occurs in moist alkaline meadows dominated by shrubby cinquefoil and Baltic rush, sometimes along stream channels.	No	No	Unlikely – In Montana, this species is known from sites in the southwest corner, in moist alkaline meadows. Alkaline meadows are not known to occur in the project area.
<i>Veratrum californicum</i> (Liliaceae) California false-hellebore	Wet meadows and streambanks in the montane and subalpine zones.	No	No	Unlikely – In Montana, this species is known from four sites in the Bitterroot Valley. Geographically unlikely to occur.

Species Unlikely to be Present

All species on the sensitive plant list are searched for during field surveys. The species discussed below that are followed by an asterisk have been found on or very near the HLCNF. Species followed by two asterisks are listed in the MTNHP database but the location is unconfirmed. Habitats for all species are described in Appendix A of the Sensitive Plants Report.

Amerorchis rotundifolia, *Aquilegia brevistyla*, *Astragalus lackschewitzii*, *Cypripedium parviflorum*, *Cypripedium passerinum*, *Drosera angelica*, *Drosera linearis*, *Epipactis gigantea*, *Goodyera repens*, *Grindelia howellii*, *Oxytropis podocarpa*, *Phlox kelseyi* var. *missoulensis*, *Polygonum douglasii* ssp. *austiniae*, *Saxifraga tempestiva*, *Schoenoplectus subterminalis*, *Thalictrum alpinum*, *Veratrum californicum* all have specialized habitat that does not occur in the analysis area. These species will not be included in the effects analysis as the specialized habitats are not known to occur.

Amerorchis rotundifolia, *Cypripedium parviflorum*, *Cypripedium passerinum*, and *Grindelia howellii* have not been found on the HLCNF to date, but the species are always searched for in any survey work. Habitat for these species does not exist in the analysis area. These species will not be analyzed further.

None of the BLM Butte Field Office sensitive species are known from the analysis area and are not analyzed further.

Species Known or Possibly Present

Peculiar moonwort, Hall's rush, Missoula phlox, and whitebark pine are the sensitive plant species known to occur in the Tenmile – South Helena project area.

Peculiar Moonwort (*Botrychium paradoxum*) is a small perennial fern that produces two fertile segments with sporangia on a single stem each year. This species commonly grows in mesic meadows associated with lodgepole pine, spruce, shrubby cinquefoil, and willows. New plants can exist entirely underground for multiple years as the juvenile plants mature into reproductive individuals. It is also common for individual mature moonwort plants to remain dormant underground in a given year and produce no above ground leaf (Ahlenlager and Potash 2007).

Some moonwort habitats, especially those created by human disturbances as well as fire, are considered to be ephemeral, and moonworts must colonize newly available habitats to stay ahead of successional changes (Zika et al. 1995). In addition, moonworts require endophytic mycorrhizae for at least a portion of their life cycle, and the presence or absence of this fungal associate probably plays a major role in the initiation of new populations. Moonworts tend to occur in areas where some mineral soil is exposed or has been exposed within the last 10 -30 years. This probably has to do with the ability of arriving spores to percolate into the soil and perhaps also with the establishment and ecology of the appropriate mycorrhizal fungi. Management activities, including grazing, that maintain these conditions may also maintain moonwort populations (Ahlenlager and Potash 2007) and thus give some occurrences greater longevity.

Hall's rush (*Juncus hallii*) is known from several locations on the HLCNF. In the Temile -South Helena project area, Hall's rush grows in wet meadows, and is documented at three locations, including sites discovered in 2009 and 2012 during project surveys. Ten additional locations occur within the combination boundary. It is rare, though widespread across the mountainous portions of southwest and central Montana. Threats and potential negative impacts to most known occurrences appear to be minimal and the species is likely tolerant of some levels of disturbance (MTNHP 2015). The Montana Natural Heritage Program has recently removed Hall's rush from their Species of Concern list, its

status re-determined as low risk, low priority due to its occurrence in at least 15 subwatersheds, low threat levels, habitat trends that appear stable and overall low risk scores in all vulnerability factors. In the next revision of the Region 1 Sensitive Plants list, Hall's rush will likely be removed due to the number of populations that are now known in Montana, and lack of significant threats to its viability in the state (Shelley 2013, pers. comm).

Missoula phlox is a low-growing perennial that inhabits gravelly windswept ridges and sometimes forb-dominated meadows on open, exposed limestone-derived slopes. As of March 2015, the Montana Natural Heritage Program database contained records of 28 occurrences in Montana, with 9 of those on the Helena National Forest. One of a cluster of three occurrences near Mac Pass is on USFS lands within the Tenmile – South Helena project boundary. Another population was located by FS crews in 2014 and is within the combination boundary near the Occidental Plateau. An additional four occurrences of Missoula phlox are located towards the west of the combination boundary.

Whitebark pine (*Pinus albicaulis*) occurs in higher elevations throughout the HLCNF. Whitebark pine is a keystone species because of its various roles in supporting community diversity and a foundation species for its roles in promoting community development and stability (Keane et al. 2012). Whitebark pine forests are declining across most of their range in North America because of the combined effects of mountain pine beetle outbreaks, fire exclusion policies and actions, and white pine blister rust. It can be promoted by removing competing conifers and creating suitable sites for regeneration.

“The decline of whitebark pine comes from a synergism of natural and human-driven causes. Periodic, massive outbreaks of mountain pine beetle, killing mature whitebark pines, have been exacerbated by suppression of natural fires. A major reduction in high-elevation fires since the early 1900's has led to successional replacement of whitebark pine on more productive sites in the part of its range where it otherwise should be abundant...White pine blister rust is killing whitebark pine trees in the intermountain region, coastal ranges, and Canadian Rocky Mountains, and rangewide mortality is expected within one to several decades.” (Tomback et al. 2001, p. 13).

Whitebark pine is dependent on fire to maintain dominance and vigor. It is shade intolerant and susceptible to mountain pine beetle and the exotic disease white pine blister rust. The success of mountain pine beetle and white pine blister rust has been exacerbated by drought. See the Forest Vegetation report for more detailed descriptions of these mortality agents and the ecology of whitebark pine. On the HLCNF, there is whitebark pine mortality from insects and disease, and evidence for the decline of this species is supported by recent Aerial Detection Survey reports and other whitebark pine monitoring. Again, see the Forested Vegetation report for further details.

Keane and others (2012) published A Range-Wide Restoration Strategy for Whitebark Pine (*Pinus albicaulis*), providing a comprehensive strategy for whitebark restoration. The strategy contains four principles:

1. Promote rust resistance, by a) supporting selective breeding programs to develop and deploy blister-rust resistant whitebark; b) facilitating and accelerating natural

selection for rust resistant trees by reducing competition, providing openings for natural seed dispersal and seedling survival; and c) planting seedlings from trees known to have some level of resistance.

2. Conserve genetic diversity, by collecting and archiving seeds and growing and planting genetically diverse seedlings.
3. Saving seed sources, by protecting mature seed-producing resistant whitebark pine trees so that apparent rust-resistant seeds can be harvested in the future; and
4. Employing restoration treatments, by considering whitebark pine areas that are in decline for restoration treatments, including limiting the spread of blister rust, using fire to encourage regeneration, implementing silvicultural cuttings to reduce competition and increase vigor and reduce likelihood of MPB attacks, planting rust-resistant seedlings to accelerate the effects of selection, and promoting natural regeneration and diverse age class structures to maintain ecosystem function and reduce landscape level beetle hazard, and to provide large populations for selection for rust resistance.

Recommended actions relative to these principles include assessments, planning, reducing disturbance impacts, gathering seeds, growing seedlings, protecting seed sources, implementing treatments, planting seedlings, monitoring activities, and conducting research (Keane et al 2012).

In the Tenmile-South Helena combination and project area, whitebark is present on subalpine fir climax habitat types. This landscape has limited sites where whitebark would be a treeline dominant. It is often present in mixed stands dominated by lodgepole pine and/or subalpine fir and Engelmann spruce. In the Tenmile-South Helena Vegetation Project area, whitebark pine is mapped on approximately 2,347 acres, identified during silvicultural diagnoses and stand exams. See the Forest Vegetation specialist report for further details of the existing condition of whitebark pine.

Two additional species are identified as possibly present in appropriate habitats and are carried forward in this analysis for the following reasons:

- Wavy moonwort (*Botrychium crenulatum*) is known from the Beaverhead-Deerlodge National Forest, immediately adjacent to the Helena National Forest and adjacent to the Divide landscape area. This species has not been found to date on the Helena National Forest; however, wavy moonwort habitat may exist in the project area along stream bottoms, around seeps, in meadows, wet roadside swales, and roadsides/disturbed areas.
- Austin knotweed (*Polygonum douglasii* ssp. *austiniae*) is known from 11 occurrences on the HLCNF. All of these are in the Big Belts landscape area. Additional occurrences exist in other directions, some within about 25 miles, so the project area is within the range of this species. Austin's knotweed habitat may exist in the project area in talus slopes, other sparsely vegetated areas, and possibly along roads.

Wavy Moonwort – Wavy moonwort is a small perennial fern that produces a single frond with sporangia above ground each year. They commonly occupy previously disturbed sites, where exposed mineral soil provides conditions necessary for germination

of its spores. Because moonworts share similar typical habitats and ecology, please refer to above discussion for peculiar moonwort.

Austin knotweed is sparsely distributed in mountainous areas of Montana from the Rocky Mountain Front to the Madison and Gallatin Ranges. As of March 2015, the Montana Natural Heritage Program database contained records of 32 occurrences in Montana, with 10 of those on the HLCNF. Sites are usually on open, gravelly, sparsely-vegetated slopes with shale derived soils and are not generally impacted by human activity. Some sites however, are along forest roads and are susceptible to weed invasion and other disturbances. This species has also been found on loose talus slopes in the Big Belts.

Sensitive Plants, Environmental Consequences

Effects Common to All Alternatives

Regardless of which alternative is chosen, some conditions and processes influencing sensitive plants would continue. Vegetation succession and natural disturbances would continue, with likely occurrences of events such as insect infestations, wildfire, flood, mass wasting, erosion, sedimentation, and storm damage (ice, wind throw, etc.).

The spread of noxious weeds has potential for adverse impacts on sensitive plant populations and habitats. Existing weed populations would continue to exist and expand, although control treatments would still occur and keep many populations in check. Noxious weeds can cause habitat degradation because they can out compete desired plant species for water, space, and nutrients. Noxious weeds can dominate plant communities and tend to form monocultures which negatively impact biological diversity. This weed competition to individual plants and communities can result in a loss of species diversity and effects to sensitive plants and their habitats. Even with continued weed control treatments, existing weed infestations would likely expand, especially in undocumented, inaccessible sites. Drift from herbicides sprayed to help control weeds can also have detrimental effects to sensitive plants. This risk is reduced by adhering to label instructions for applying specific herbicides, and by application of measures in the Helena Final Environmental Impact Statement and Record of Decision for the Helena National Forest Weed Treatment Project that require a 100-foot buffer around sensitive plant species when applying herbicides (USDA 2006). Within this buffer, only hand-pulling of weeds would be allowed.

Mountain pine beetle infestations have compromised the lodgepole pine component of forested vegetation in the project area. Over time, the dead lodgepole will fall and create pockets of heavy fuel loads. As a result, the potential for fire to occur in the project area exists, regardless of the chosen alternative. The potential exists for wildfire to have a short-term adverse effect on sensitive plant habitats, but no long-term effects in most cases. Plant response to fire is a result of the interaction between severity of the fire and the individual plant species' inherent resistance to injury and ability to recover (Brown and Kapler Smith 2000). Mortality of herbaceous species is more dependent on the length of time plants are exposed to high heat, determined by the amount of duff and woody fuel consumed by the fire, than flame length and fire line intensity (Armour et al. 1984). The effect of wildfire on sensitive plant habitats therefore would depend on the weather,

surface fuel conditions, and type of fire. The longer the amount of time fuels build up on the forest floor, the greater the potential damage to herbaceous sensitive plant habitats.

Wildfires also risk enhancing noxious weed invasions if severe fires damage the native vegetation. Large stand-replacing fires are known to increase the risk of infestation by noxious weeds (D'Antonio 2000). Canada thistle, bull thistle, knapweeds, Dalmatian toadflax, and cheatgrass have been shown to increase following wildfire (Harrod and Reichard 2001).

For species in specialized habitats (wet or, open exposed areas), wildfire effects would be considerably less. Wet habitats would continue to experience occasional flooding and movement of sediments.

Wavy Moonwort and Peculiar Moonwort

Moonwort habitats on the larger landscape would continue their ephemeral nature, with individual occurrences becoming established in some locations (often as a result of disturbance) while others would succumb to successional changes as the overstory tree canopy continues to develop and/or expand (Ahrensleger and Potash 2007). The known moonwort occurrence in the combination boundaries suggests that additional populations probably do exist in the area. Wildfire at an occupied site could damage above-ground plant parts or kill the entire plants if enough heat penetrates into the soil (Ahrensleger and Potash 2007). Wildfire could also create new areas of habitat which may be colonized and maintained until earlier successional stages are eventually passed (Zika et al. 1995).

Hall's Rush

Wildfire would not likely affect Hall's rush occurrences or habitat beyond a light scorching due to the high moisture in its habitat. No major effect to Hall's rush occurrences or habitats is expected with any alternative. In action alternatives, impacts to these wet meadow habitats would be prevented by buffering activities. Only very minor effects are possible with the action alternatives, and they are described in those sections.

Whitebark Pine

Due to the limited habitat types and topography where whitebark pine could be expected to dominate, none of the alternatives would considerably alter the abundance or health of whitebark pine at the landscape or Forest scales, or measurably impact the viability of whitebark pine across its range. At these broad scales, the overall decline of whitebark pine due to the factors identified by the USFWS (USDI 2011) would generally continue.

Insect outbreaks and white pine blister rust would continue to affect whitebark pine, along with weather and wildfire events. In the event of wildfire, the opportunity to selectively retain desirable rust-resistant individuals is lost, and the happenstance pattern of fire severities would determine the type and magnitude of effects to whitebark pine. Considering the unknowns of future wildfire incidents and effects, including differing wildfire behavior expected as a result of vegetation treatments, whitebark pine is still likely to burn in such events in the future, experiencing a range of fire intensities and a mix of beneficial and adverse effects. Higher wildfire severity could adversely affect

whitebark pine by killing mature seed bearing trees (possibly including important rust-resistant individuals), thus making regeneration less prevalent.

In areas without fire or other appropriate disturbances, over time, whitebark pine may cease to be a stand component in the absence of natural disturbance or management intervention due primarily to competition from other tree species and the limited availability of seed trees and suitable regeneration sites. Implementation of this project in the near future would have the potential to limit the elimination of whitebark pine as a stand component.

Missoula Phlox and Austin Knotweed

Wildfire poses very little threat to the open habitats of Missoula phlox and Austin knotweed. Wildfire could actually help maintain these habitats by removing conifer encroachment along the edges of the openings. Noxious weed invasion is likely the greatest threat for these habitats in the Tennmile – South Helena Project area.

Effects Common to All Action Alternatives

Both action alternatives are similar in terms of the treatment types being proposed. Alternative 3 proposes fewer acres of all activities except private land buffers which are increased by approximately 200 acres. Additionally, alternative 3 includes nine units of low severity grassland prescribed fire. The differences between the alternatives are discussed in the alternative 2 and alternative 3 sections below. The effects described here are common to both action alternatives.

For both alternatives, vegetation treatments include the following:

- Improvement Harvest
- Regeneration Harvest
- Prescribed Fire
- Private Land Buffers
- Pre-commercial Thinning

In order to haul materials and access the treatment areas, the following road activities are proposed:

- Temp Road Construction, followed by Full Obliteration
- Road Maintenance
- Road Reconstruction

Both action alternatives would involve ground disturbance from tree removal equipment and temporary road construction which has the potential to affect sensitive plant populations. The effects of ground disturbance on sensitive plants would be similar for both action alternatives, and include direct impacts such as mechanical damage, human trampling, and defoliation to any undiscovered occurrences, as well as increased risk of noxious weed infestation for all sensitive plant habitats. With the design criteria resource protection measures, the action alternatives may impact individuals but would not contribute toward a trend for federal listing or loss of viability.

The potential for additional infestations and/or spread of noxious weeds would likely be higher in treatment areas due to the increase in disturbed areas available for colonization and movement of equipment, vehicles, and personnel, providing transport vectors for weeds. Several preventive and control measures would be implemented to reduce noxious weed impacts, including control treatment for known sites, weed-free requirements for equipment entering the project area, monitoring, and follow-up control treatment. Even though weed treatments would likely be stepped up in the project area during and after implementation, there would likely be some infestations that remain undiscovered or otherwise escape treatment. Weed control treatments are rarely completely successful, and some infestations are likely to continue to persist and produce seed. These infestations have potential to affect or invade habitats for any of the sensitive species.

Prescribed fire and pile burning after tree removal are proposed to reduce surface fuels. The use of prescribed fire would be expected to stimulate the growth of native understory vegetation over the long term (Armour et al. 1984). Prescribed fire treatments are likely to increase the overall understory native species richness (Dodson et al. 2008; McGlone et al. 2009) and percent cover, although non-native species may also be promoted if allowed to spread into treated areas (McGlone et al. 2009).

Wildfire risks (behavior and intensities) would generally be reduced with the action alternatives, varying by proximity to treatment units among other factors.

Wavy Moonwort and Peculiar Moonwort

Existing moonwort habitats would be mostly unaffected due to riparian buffers and these moonworts' preference for wet/moist sites. However, some habitats may exist in drier sites (peculiar moonwort can occur in rough fescue habitats, and roadside swales can sometimes provide suitable habitat for both moonworts). Most of the moonwort habitat in treatment units would be included in appropriately buffered riparian and wetland areas and thus protected from major disturbances. Some habitats in drier sites, including appropriate roadside locations, could be directly impacted by the ground disturbance associated with the vegetation treatments and road maintenance and reconstruction activities. Moonwort individuals, if present, could be damaged or killed by these activities.

Conversely, disturbance in some locations may create new moonwort habitat, and these new habitats can be important for sustaining populations across the landscape as older occupied sites are lost to succession. Because moonworts tend to favor disturbed areas (Zika 1995), the action alternatives would generally improve habitat conditions. So, there would be potential for adverse effects to individuals, if present, and beneficial effects to moonwort habitats from both action alternatives.

Prescribed fire treatments would not likely affect the typical wetter moonwort habitats, but drier and ecotonal moonwort habitats could be burned or scorched from prescription fires backing into these boundary areas from adjacent burn units. Prescribed burning could actually help provide an appropriate amount of disturbance in some areas to create or perpetuate moonwort habitats. Individuals would be top-killed by fire, and would likely survive low severity fires to continue leaf production the following year.

Because of their small size, moonwort species are easily overlooked, and these plants may be present even in areas that were previously surveyed. If undocumented populations are present, these moonwort species could be impacted by road reconstruction, maintenance or obliteration activities, in addition to ground disturbance and fire in treatment units. The action alternatives would generally promote habitat for these two moonwort species by creating more open conditions, and providing disturbance, thus possibly creating potential sites suitable for future colonization.

Hall's Rush

Hall's rush populations and habitat would be protected from all major effects from ground disturbance by the specific avoidance of known occurrences and restricted activities in and around its riparian habitat. With these protection measures in place, no direct effects from the activities are expected.

Prescribed fire treatments would not likely affect the wet meadows where Hall's rush grows, due to the lack of woody fuels and high moisture in the meadows. Ignitions would not be allowed within RHCAs.

Whitebark Pine

The action alternatives would promote whitebark pine by creating more open conditions, reducing shade-tolerant conifer competition, reducing susceptibility to insects, fire, and pathogens, creating sites suitable for re-establishment, and/or retaining live trees where available.

Units which contain whitebark pine would be harvested or burned to remove competing species and create post-disturbance conditions suitable for whitebark establishment. Treatments would remove lodgepole pine and subalpine fir, allowing whitebark to grow and establish new seedlings.

Within treated areas on the appropriate habitat types, whitebark pine is more likely to be retained and increased as a stand component for both action alternatives. While the scale of this effect is relatively minor, the action alternatives would help to conserve whitebark genetics to the extent possible and ensure mature individuals are available for continued regeneration and natural selection processes in the near future and that long term (beyond 10-20 years) species presence in the project area would be maintained.

Mechanical treatments could incidentally damage or kill some young whitebark pines as tree removal equipment and personnel maneuver about the treatment areas. Some mortality of seedlings can be expected in prescribed burn areas as well.

Adverse impacts to whitebark pine would also be minimized through specific design criteria. Some individual whitebark pine seedlings would likely be damaged or killed in the activities, but the whitebark pine would benefit overall from the treatments. Whitebark pine habitat conditions would be improved by removing competing conifers and providing suitable conditions for seedling survival. In untreated areas, increased competition from other conifers would continue.

Further details of anticipated effects to whitebark pine are described in the Forest Vegetation specialist report.

Missoula Phlox and Austin Knotweed

Habitats for Missoula phlox and Austin knotweed would be mostly unaffected by proposed activities. Many areas of affected habitat are small openings within treatment units (inclusions). Commercial and non-commercial treatments are proposed in forested areas, and Missoula phlox and Austin knotweed habitats are non-forested. Prescribed fire and tree removal along the edges of these openings would help to maintain these open habitats by setting back conifer encroachment. Undiscovered occurrences could be impacted by prescribed fire. In these openings, prescribed fire would likely burn quickly and with low severity through the grasses. In the less vegetated areas where Missoula phlox and Austin knotweed would likely occur, prescribed fire effects would be even less severe. Assuming a fire response similar to a closely related species, Hood's phlox (*Phlox hoodii*), Missoula phlox could be top-killed if burned over, but would likely survive and sprout new growth from its thick base or caudex (Gucker 2006). Austin knotweed is an annual plant, so top-kill would be fatal for the unlucky individuals, and this could decrease its seed production for that year. Adverse effects from prescribed fire would be short-term. Beneficial effects of prescribed fire include mortality of conifer encroachment into the openings and the renewal of nutrient cycling processes.

There are no other known occurrences of sensitive species in the project area; however, if undiscovered occurrences are present those plants may be directly impacted by ground-disturbing activities.

Alternative 1

Direct/Indirect Effects

No effects would occur to sensitive plants under this alternative except the effects noted under "Effects Common to All Alternatives" section of this document. Sensitive plants would remain undisturbed except in the case of wildfire or the spread of noxious weeds.

Irreversible/Irretrievable Commitments

There are no irreversible/irretrievable commitments that would affect sensitive plants under this alternative.

Cumulative Effects

The cumulative effects analysis area is the Helena National Forest, as effects on plant populations throughout the Forest are considered in determining potential impacts to the overall population. Cumulative effects described here for the No Action alternative also apply for the action alternatives.

Cumulative effects from the list of projects noted in the Appendix B of the Sensitive Plants Report, would be minimal. The projects that have occurred since 1993 have all had field surveys to determine whether sensitive plant populations would be impacted by those actions. Where sensitive plant populations were found, populations were appropriately buffered from treatment. The actions listed in Appendix B of the Sensitive

Plants Report, could impact individuals or habitat but will not likely contribute to a trend toward Federal listing or cause a loss of viability to the populations or species.

Past activities may have caused minor impacts to sensitive plants or their habitats. The effects of past activities are reflected in the existing condition of the current sensitive plant populations. Particularly for those sensitive species related to disturbance (moonworts, whitebark pine, some habitats for Austin knotweed), these past actions likely resulted in mixed effects (possible damage or loss of individuals, but improvement of habitat conditions in some affected areas).

Present/ongoing activities that could be contributing to cumulative effects are also described in Appendix B of the Sensitive Plants Report. There are only minor effects to sensitive plant habitats resulting from ongoing activities, with a low probability of impacting individuals.

Reasonably foreseeable activities that could affect sensitive plants or their habitats are also addressed in Appendix B of the Sensitive Plants Report, and the major activities and expected effects are summarized below:

For the reasonably foreseeable future, the following projects have been reviewed: Telegraph Vegetation Project, Grassy Mountain Vegetation Project, Stonewall Vegetation Management Project, and Blackfoot Summer Travel Plan.

- Telegraph Vegetation Project. This project would treat approximately 6,300 acres with a combination of pre-commercial thinning, timber harvest and prescribed fire. Up to 6 miles of new temporary road would be built. There are known populations of whitebark pine and Hall's rush in this project area. Those populations have been identified and design criteria appropriate for each species would protect populations.
- Grassy Mountain Vegetation Project. This project would treat approximately 3900 acres with a combination of prescribed fire and timber harvest. Up to 0.5 miles of new temporary road would be built. Intensive vegetation data collection in the project area was completed in 2006. No sensitive plant populations were found during those surveys or previous surveys. If any populations are found at any time they will be protected from ground disturbance or herbicide application.
- Stonewall Vegetation Management Project: This project would treat approximately 8500 acres with a combination of pre-commercial thinning, timber harvest and prescribed fire. Up to 5 miles of new temporary road would be built. Field surveys of the proposed units and temporary roads were completed in 2009. There are known populations of *Pinus albicaulis* in the project area. Design criteria would protect all known sensitive plant populations as appropriate. If additional sensitive plant populations are found at any time, they would be protected from ground disturbance or herbicide application.
- Blackfoot Summer Travel Plan: This decision would be to determine what roads would be open to motorized traffic. The decision would also include prescriptions for closing routes which would include ground disturbance. There are known sensitive plant populations of *Drosera anglica*, *Drosera linearis*, *Phlox kelseyi* var. *missoulensis*, *Pinus albicaulis*, and *Schoenoplectus subterminalis* within the

project area that could potentially be affected. These populations have been identified in the sensitive plant analysis and would be protected from ground disturbing activities and herbicide application. Design criteria and continuing monitoring would protect any sensitive plant populations found.

Surveys are currently occurring or have been completed for future foreseeable actions. If populations have been/are found, they will be protected from ground disturbance or herbicide application. For more information, please see the Cumulative Effects Table in the project file.

Alternative 2

A total of 24,308 acres of combined vegetation treatments in 298 units are proposed in this alternative.

Table 160. Alternative 2: general prescriptions.

Vegetation Treatment	Alternative 2 Acres	Alternative 2 Number of Units
Improvement Harvest	2,483	49
Clearcut with Leave Trees	3,573	41
Seed Tree with Leave Trees	298	3
Shelterwood with Leave Trees	363	4
Shaded Fuel Break	1,415	10
Low Severity Grassland Prescribed Fire	0	0
Low Severity Prescribed Fire	11,900	118
Mixed Severity Prescribed Fire	1,714	10
Private Land Buffers	2,091	45
Precommercial Thin	471	18
Total acres	24,308	298

Table 161. Alternative 2: road activities

Road Management	Alternative 2 (miles)
FS New Temporary Road Construction	39
BLM New Temporary Road Construction	4
Roads Decommissioned	15
Road Reconstruction	32
Road Maintenance	6

In addition, the following activities are intended to improve water quality and aquatic habitat conditions in project area streams, including streams that deliver water to the City of Helena's municipal water supply intakes. These activities also move the forest toward meeting the restoration goals of the Lake Helena TMDL. These activities would occur in both action alternatives.

- Wetland restoration along Forest road 299—restore hydrology and some road reconstruction to provide better drainage control through the road.
- Forest road 299 re-routes—approximately 2000 feet of road would be relocated out of a wetland and onto a drier, low-gradient side slope.
- Road decommissioning—Approximately 15 miles of road segments would be decommissioned, some prior to vegetation activities and some after completion of project activities.
- Westslope Cutthroat Trout restoration—in cooperation with Montana FWP, the project would remove non-native species above existing barrier structures in Moose Creek and lower Minnehaha Creek by mechanical methods such as electrofishing, and reintroduce native westslope cutthroat trout. The proposal implements guidance of the Montana Cutthroat Trout Steering Committee (MCTSC) and the intent of the memorandum of understanding (MOU) developed by its members, which included fisheries managers, conservation groups, tribes, and various industry concerns to ensure the long-term, self-sustaining persistence of westslope cutthroat trout within their historic range utilizing measures that include reestablishing non-hybridized populations where they have been extirpated. No ground-disturbance would occur for this activity.

Direct/Indirect Effects

No effects would occur to sensitive plants under this alternative except the effects noted under “Effects Common to All Action Alternatives” section of this document.

Irreversible/Irretrievable Commitments

There is potential for some incidental whitebark pine individuals to be killed or damaged during treatment operations from equipment operation and/or prescribed fire. However this would be minimized through the design criteria described. The individual trees impacted could be lost, constituting an irreversible commitment. However, these trees can be replaced and therefore would only be an irretrievable impact to whitebark pine overall. The magnitude of this loss is expected to be very minor. Because the treatments also involve creating conditions suitable for natural regeneration and tree planting where

possible, overall whitebark pine would be promoted and the new seedlings established would far outweigh the number potentially lost. These impacts would be an irretrievable commitment with no irreversible commitments.

Cumulative Effects

Please see the cumulative effects section under alternative 1 for a description of projects. Under alternative 2, the cumulative effects would likely be minimal. Surveys are currently occurring or have been completed for future foreseeable actions. If populations have been/are found, they will be protected from ground disturbance or herbicide application. For more information, please see the Cumulative Effects Appendix to the Botany Report.

The effects from these projects, when combined with the effects of alternative 2 of the Tenmile – South Helena project, would not result in a trend toward federal listing for any sensitive plant species.

Conclusions

Federally Listed Plants

Due to the lack of federally listed plant species within the Tenmile – South Helena Project area, and on the Forest in general, implementation of alternative 2 would have no effects on listed plants.

Forest Service Sensitive Plants

As stated, direct, and indirect impacts to sensitive plants can result from implementing vegetation management projects.

Wavy Moonwort

Direct, Indirect, and Cumulative Effects of Alternative 2:

This species is known from the Beaverhead-Deerlodge Forest, immediately adjacent to the HLCNF. This species is associated with wetland habitats. Wetlands, seeps and springs would be protected from ground disturbance in the design criteria for this project. Field surveys would occur prior to project implementation. Should any populations be found, a buffer would be established around each plant population as a no-entry zone for equipment. Buffer is dependent on the population and would be determined in the field. Weed treatments would follow the 100 foot buffer guidance in the Helena National Forest Weed Treatment Project EIS (USDA 2006). Cumulative effects to this species have not caused a trend toward federal listing or loss of viability. See Cumulative Effects section and Forestwide Cumulative Effects Table in the project file.

Determination:

The decision may impact individuals but would not contribute toward a trend for federal listing or loss of viability because the species is not known from the analysis area and design criteria as described above would protect potential habitat.

*Peculiar Moonwort***Direct, Indirect, and Cumulative Effects of Alternative 2:**

Botrychium paradoxum is known from two populations on the Helena National Forest, both in the Divide landscape area. The habitat for this species on the HLCNF is open grassland and open grassland/sagebrush. One population is known to occur within the combination boundary, and habitat with potential to support this species does occur. Field surveys would occur prior to project implementation. Should any additional populations be found, a buffer would be established around each plant population as a no-entry zone for equipment. Weed treatments would follow the 100 foot buffer guidance in the Helena National Forest Weed Treatment Project EIS (USDA 2006). Cumulative effects to this species have not caused a trend toward federal listing or loss of viability. See Cumulative Effects section and Forestwide Cumulative Effects Table in the project file.

Determination:

The decision may impact individuals but would not contribute toward a trend for federal listing or loss of viability. There are no known populations within the analysis area and design criteria as described above would protect individuals and potential habitat.

*Hall's Rush***Direct, Indirect, and Cumulative Effects of Alternative 2:**

This species has eighteen populations forest wide. Three populations are of Hall's rush are known from the project area, two being located at the edge of treatment units. Field surveys would occur prior to project implementation. Should any additional populations be found, a buffer would be established around each plant population as a no-entry zone for equipment. Broadleaf herbicides would not be impactful to this species; only nonspecific herbicides such as dicamba would be harmful. If nonspecific herbicides were proposed for use and any populations were found, an appropriate buffer around populations would be established. Cumulative effects to this species have not caused a trend toward federal listing or loss of viability. See Cumulative Effects section and Forestwide Cumulative Effects Table in the project file.

Determination:

The decision may impact individuals but would not contribute toward a trend for federal listing or loss of viability. The species is known from the analysis area, but design criteria as described above would protect individuals and potential habitat.

*Missoula Phlox***Direct, Indirect, and Cumulative Effects of alternative 2:**

This species has nine populations forest wide. Two populations are known from the project area, one near Mac Pass and another near Occidental Plateau. Because of the proximity of known occurrences, there is potential that additional populations may exist within the project area. Field surveys would occur prior to project implementation. Should any additional populations be found, a buffer would be established around each plant population as a no-entry zone for equipment. The greatest danger to this species would be from herbicide application or ground disturbance. A buffer would be

established around each plant population as a no-entry zone for equipment. Buffer is dependent on the population and would be determined in the field. Weed treatments would follow the 100 foot buffer guidance in the Helena National Forest Weed Treatment Project EIS (USDA 2006). Cumulative effects to this species have not caused a trend toward federal listing or loss of viability. See Cumulative Effects section and Forestwide Cumulative Effects Table in the project file.

Determination:

The decision may impact individuals but is not likely to result in a loss of viability, nor cause a trend toward federal listing. This species is known from the project area, but design criteria associated with the project would protect the individuals and potential habitat.

*Whitebark Pine***Direct, Indirect, and Cumulative Effects of alternative 2:**

This species is known from higher elevations (above 7000 feet) across the Forest. Silvicultural information including field reconnaissance, stand exams and diagnoses were used to analyze the presence and effects on whitebark pine (*Pinus albicaulis*). Please refer to the Forest Vegetation Specialist Report for specific details as to the specific effects on this species.

Determination:

The decision may impact individuals but would not contribute toward a trend for federal listing or loss of viability. The species is known from the analysis area, but design criteria as described in the Forest Vegetation Specialist Report would protect individuals and potential habitat. In addition, potential habitat would increase with the action alternatives.

*Austin Knotweed***Direct, Indirect, and Cumulative Effects of alternative 2:**

This plant is known from the Big Belt Mountains as well as Dry Creek in the South Belts. Austin knotweed is not known from the project area, but potential habitat may exist. Field surveys would occur prior to project implementation. Should any additional populations be found, a buffer would be established around each plant population as a no-entry zone for equipment. Weed treatments would follow the 100 foot buffer guidance in the Helena National Forest Weed Treatment Project EIS (USDA 2006). Habitat for this species would most likely be affected by prescribed fire. The species evolved with wildfire and was located in the Cave Gulch fire area after the wildfire occurred. Cumulative effects to this species have not caused a trend toward federal listing or loss of viability. See Cumulative Effects section and Forestwide Cumulative Effects Table in the project file.

Determination:

The decision may impact individuals or habitat but would not contribute toward a trend for federal listing or loss of viability. This species evolved with wildfire and it is unlikely

that long-term adverse effects would occur to this species from prescribed fire. The resource protection measures as described above would protect potential habitat.

Alternative 3

Alternative 3 was developed in response to issues presented in both internal and external scoping comments about potential treatment effects on Inventoried Roadless Areas, wildlife, and recreationist values associated with the numerous trail systems in the project area. A total of 17,374 acres of combined vegetation treatments in 177 units are proposed in this alternative.

Table 162. Alternative 3: general prescriptions

Vegetation Treatment	Alternative 3 Acres	Alternative 3 Number of Units
Improvement Harvest	1,382	23
Clearcut with Leave Trees	2,348	19
Seed Tree with Leave Trees	0	0
Shelterwood with Leave Trees	102	2
Shaded Fuel Break	1,282	8
Low Severity Grassland Prescribed Fire	1,662	9
Low Severity Prescribed Fire	7,952	96
Mixed Severity Prescribed Fire	656	4
Private Land Buffers	2,283	46
Precommercial Thin	445	16
Total acres	18,112	223

Table 163. Alternative 3: road activities

Road Management	Alternative 2 (miles)
FS New Temporary Road Construction	21
BLM New Temporary Road Construction	3
Roads Decommissioned	15
Road Reconstruction	28
Road Maintenance	4

In addition, the following activities are intended to improve water quality and aquatic habitat conditions in project area streams, including streams that deliver water to the City of Helena's municipal water supply intakes. These activities also move the forest toward meeting the restoration goals of the Lake Helena TMDL. These activities would occur in both action alternatives.

- Wetland restoration along Forest road 299— Restore hydrology and some road reconstruction to provide better drainage control through the road.
- Forest road 299 re-routes— Approximately 2000 feet of road would be relocated out of a wetland and onto a drier, low-gradient side slope.

- Road decommissioning— Approximately 15 miles of road segments would be decommissioned, some prior to vegetation activities and some after completion of project activities.
- Westslope Cutthroat Trout restoration — In cooperation with Montana FWP, the project would remove non-native species above existing barrier structures in Moose Creek and lower Minnehaha Creek by mechanical methods such as electrofishing, and reintroduce native westslope cutthroat trout. The proposal implements guidance of the Montana Cutthroat Trout Steering Committee (MCTSC) and the intent of the memorandum of understanding (MOU) developed by its members, which included fisheries managers, conservation groups, tribes, and various industry concerns to ensure the long-term, self-sustaining persistence of westslope cutthroat trout within their historic range utilizing measures that include reestablishing non-hybridized populations where they have been extirpated. No ground-disturbance would occur for this activity.

Direct/Indirect Effects

Please refer to effects noted under “Effects Common to All Action Alternatives” section of this document.

Irreversible/Irretrievable Commitments

The irreversible and irretrievable commitments are the same as described for alternative 2, with the potential effects occurring on fewer acres proportionate to the treatments occurring in whitebark pine habitat with alternative 3.

Cumulative Effects

Please see the cumulative effects section under alternative 1 for a description of projects. Under alternative 3, the cumulative effects would likely be minimal. Surveys are currently occurring or have been completed for future foreseeable actions. If populations have been/are found, they would be protected from ground disturbance or herbicide application. For more information, please see the Cumulative Effects Appendix to this report.

The effects from these projects, when combined with the effects of alternative 3 of the Tennmile – South Helena project, would not result in a trend toward federal listing for any sensitive plant species.

Conclusions

Federally Listed Plants

Due to the lack of federally listed plant species within the Tennmile – South Helena Project area, and on the Forest in general, implementation of alternative 2 would have no effects on listed plants.

Forest Service Sensitive Plants

As stated, direct, and indirect impacts to sensitive plants can result from implementing vegetation management projects.

*Wavy Moonwort***Direct, Indirect, and Cumulative Effects of alternative 3:**

This species is known from the Beaverhead-Deerlodge Forest, immediately adjacent to the HLCNF. This species is associated with wetland habitats. Wetlands, seeps and springs would be protected from ground disturbance in the design criteria for this project. Field surveys would occur prior to project implementation. Should any populations be found, a buffer would be established around each plant population as a no-entry zone for equipment. Buffer is dependent on the population and would be determined in the field. Weed treatments would follow the 100 foot buffer guidance in the Helena National Forest Weed Treatment Project EIS (USDA 2006). Cumulative effects to this species have not caused a trend toward federal listing or loss of viability. See Cumulative Effects section and Forestwide Cumulative Effects Table in the project file.

Determination:

The decision may impact individuals but would not contribute toward a trend for federal listing or loss of viability because the species is not known from the analysis area and design criteria as described above would protect potential habitat.

*Peculiar Moonwort***Direct, Indirect, and Cumulative Effects of alternative 3:**

Botrychium paradoxum is known from two populations on the Helena National Forest, both in the Divide landscape area. The habitat for this species on the Helena National Forest is open grassland and open grassland/sagebrush. One population is known to occur within the combination boundary, and habitat with potential to support this species does occur. Field surveys would occur prior to project implementation. Should any additional populations be found, a buffer would be established around each plant population as a no-entry zone for equipment. Weed treatments would follow the 100 foot buffer guidance in the Helena National Forest Weed Treatment Project EIS (USDA 2006). Cumulative effects to this species have not caused a trend toward federal listing or loss of viability. See Cumulative Effects section and Forestwide Cumulative Effects Table in the project file.

Determination:

The decision may impact individuals but would not contribute toward a trend for federal listing or loss of viability. There are no known populations within the analysis area and design criteria as described above would protect individuals and potential habitat.

*Hall's Rush***Direct, Indirect, and Cumulative Effects of alternative 3:**

This species has eighteen populations forest wide. Three populations are of Hall's rush are known from the project area, two being located at the edge of treatment units. Field surveys would occur prior to project implementation. Should any additional populations be found, a buffer would be established around each plant population as a no-entry zone for equipment. Broadleaf herbicides would not be impactful to this species; only nonspecific herbicides such as dicamba would be harmful. If nonspecific herbicides were

proposed for use and any populations were found, an appropriate buffer around populations would be established. Cumulative effects to this species have not caused a trend toward federal listing or loss of viability. See Cumulative Effects section and Forestwide Cumulative Effects Table in the project file.

Determination:

The decision may impact individuals but would not contribute toward a trend for federal listing or loss of viability. The species is known from the analysis area, but design criteria as described above would protect individuals and potential habitat.

*Missoula Phlox***Direct, Indirect, and Cumulative Effects of alternative 3:**

This species has nine populations forest wide. Two populations are known from the project area, one near Mac Pass and another near Occidental Plateau. Because of the proximity of known occurrences, there is potential that additional populations may exist within the project area. Field surveys would occur prior to project implementation. Should any additional populations be found, a buffer would be established around each plant population as a no-entry zone for equipment. The greatest danger to this species would be from herbicide application or ground disturbance. A buffer would be established around each plant population as a no-entry zone for equipment. Buffer is dependent on the population and would be determined in the field. Weed treatments would follow the 100 foot buffer guidance in the Helena National Forest Weed Treatment Project EIS (USDA 2006). Cumulative effects to this species have not caused a trend toward federal listing or loss of viability. See Cumulative Effects section and Forestwide Cumulative Effects Table in the project file.

Determination:

The decision may impact individuals but is not likely to result in a loss of viability, nor cause a trend toward federal listing. This species is known from the project area, but design criteria associated with the project would protect the individuals and potential habitat.

*Whitebark Pine***Direct, Indirect, and Cumulative Effects of alternative 3:**

This species is known from higher elevations (above 7000 feet) across the Forest. Silvicultural information including field reconnaissance, stand exams and diagnoses were used to analyze the presence and effects on whitebark pine (*Pinus albicaulis*). Please refer to the Forest Vegetation Specialist Report for specific details as to the specific effects on this species.

Determination:

The decision may impact individuals but would not contribute toward a trend for federal listing or loss of viability. The species is known from the analysis area, but design criteria as described in the Forest Vegetation Specialist Report would protect individuals and potential habitat.

*Austin Knotweed***Direct, Indirect, and Cumulative Effects of alternative 3:**

This plant is known from the Big Belt Mountains as well as Dry Creek in the South Belts. Austin knotweed is not known from the project area, but potential habitat may exist. Field surveys would occur prior to project implementation. Should any additional populations be found, a buffer would be established around each plant population as a no-entry zone for equipment. Weed treatments would follow the 100 foot buffer guidance in the Helena National Forest Weed Treatment Project EIS (USDA 2006). Habitat for this species would most likely be affected by prescribed fire. The species evolved with wildfire and was located in the Cave Gulch fire area after the wildfire occurred. Cumulative effects to this species have not caused a trend toward federal listing or loss of viability. See Cumulative Effects section and Forestwide Cumulative Effects Table in the project file.

Determination:

The decision may impact individuals or habitat but would not contribute toward a trend for federal listing or loss of viability. This species evolved with wildfire and it is unlikely that long-term adverse effects would occur to this species from prescribed fire. The resource protection measures as described above would protect potential habitat.

Forest Plan Consistency

The Forest Plan direction for sensitive plants (USDA 1986, II/20) refers to the Endangered Species Act and pertains only to listed species, none of which occur on the Helena National Forest. Therefore, this direction is not applicable at this time. Subsequent guidance from the Regional Office provides direction regarding sensitive plants and their habitats with which the project as proposed is consistent.

Noxious Weeds

Introduction

An invasive plant is an alien plant whose introduction does or is likely to cause economic or environmental harm, or harm to human health (Executive Order 13112). Invasive plants are capable of successfully expanding their populations into new ecosystems beyond their natural range. In December 2011, the United States Forest Service adopted new guidelines for invasive plant management in the form of a new Forest Service Manual (FSM) 2900 (USDA Forest Service 2011), which requires the development of a risk assessment as part of an environmental analysis for ground-disturbing activities. This report includes that process for an invasive plant risk assessment.

The invasive plants risk assessment is based on two factors. The factors identified are used to categorize the level of risk of invasion or increase in the level of infestation of invasive plant species as a result of ground disturbing activities performed or authorized by the United States Forest Service. An overall scoring or "Risk Rating" is assigned using the criteria and scores assigned to each factor. This rating process takes into account the potential ecological impact, biological characteristics, current distribution and the dispersal potential of known invasive plants in or near the project area. Specific actions are required for each level of risk. Actions include mitigation and monitoring measures to

address current and potential invasive plant infestations and avoid negative ecological impacts.

The information in this assessment is intended to describe the current condition of invasive plants within the Tenmile - South Helena Project area and the relative risk of expansion of their current infestation size and densities as a result of the proposed project. The initial risk evaluation for both action alternatives are provided as Appendix A to the Noxious Weed Report located in the project record.

A total of 6,261 acres are currently known to be infested by one or more invasive plant species within the Tenmile – South Helena project area. There are a total of 15 invasive plant species known to occur within the project area. The dominant invasive plant species within the project area include dalmation toadflax, spotted knapweed and musk thistle.

Forest Service Manual (FSM) 2900 (USDA Forest Service 2011) requires the development of a risk assessment as part of an environmental analysis for ground-disturbing activities. This report follows that process for an invasive plant risk assessment. The findings of the risk assessment as well as review of best available science was used to inform the analysis of the direct, indirect and cumulative effects of the various alternatives considered to address the need for action as they pertain to invasive plants.

The effects of the project would vary by alternative and are expected to be both positive and negative depending on the particular activity. In general, areas with disturbed soils (natural or human caused) that contain or are adjacent to invasive plant infestations have the highest vulnerability to further colonization and expansion of invasive plant infestations. Restoration activities that address disturbance and/or enhance native plant communities would aid in combating invasive plant infestations.

The information in this assessment is intended to describe the current condition of invasive plants within the Tenmile - South Helena project area and the relative risk of expansion of their current infestation size and densities as a result of the proposed project. The initial risk assessment rating sheet and the associated risk analysis is provided as Appendix A to the Noxious Weed Report located in the project record.

Assumptions

The following assumptions were used:

- The analyses and decisions made in the record of decision for the HNF Weed Treatment Project FEIS are incorporated in noxious weed analysis and management on the HLCNF. This includes all environmental protection measures. The environmental protection measures are incorporated into the design criteria/mitigation of this report and are considered to accurately address noxious weed management concerns.
- Any soil disturbing activity has the potential to increase noxious weed invasion or spread. It is assumed that the maximum amount of soil disturbance would not exceed 15 percent of units pursuant to Forest Plan standards for detrimental soil disturbance. Additional increase in acres of potential noxious weed infestation is

anticipated due to other non-soil disturbing treatment activities resulting in habitat alterations (example: reduced canopy density).

- As of 1996, invasive plant species had invaded 6 to 7 million acres of NFS lands with an observed annual rate of spread of 8 to 12 percent (USDA Forest Service 1998). Local data does not currently exist to determine the annual rate of spread of invasive plants on the Helena and Lewis & Clark National Forests (HLCNF). As a result it is assumed that the national average rate applies. It is anticipated that the rate of spread could increase in areas affected by ground disturbing activities. Disturbance is widely recognized as a primary influence on plant community composition and is frequently implicated in the spread of invasive exotic plants (Hobbs and Humphries 1995).
- Herbicide use in accordance with the requirements specified in the HNF Weed Treatment Project FEIS (USDA 2006) is appropriate for noxious weed management on infested lands.

Information and Methodology Used

The following methods and associated data were used to analyze the current condition of invasive species within the project area:

- Summarization of existing Geospatial Information Systems (GIS) data as entered through the Threatened, Endangered, and Sensitive Plants, and Invasive Species (TESP-IS) database and reported through the Geospatial Interface (GI);
- Summarization of existing Forest Service Activity Tracking System (FACTS) data;
- Literature review of the best available science.

The aforementioned information was used to complete an Invasive Plant Risk Evaluation. The intent of this invasive plant risk evaluation is to determine the level of risk of invasion and/or increased infestation of invasive plant species as a result of proposed ground disturbing activities. Four factors were considered when assigning an overall risk rating to the proposed project. The four factors include susceptibility, threat, disturbance and exposure. Two of the factors (susceptibility and threat) have been combined into a composite factor titled "overall invasiveness rating". A more in depth discussion of the process as well as a description of each factor and guidance on scoring those factors are provided within Appendix B to the Noxious Weed Report.

Additional inventory data is needed to fully capture the current extent of invasive plants within the project area. Additional monitoring data is also needed to determine the annual rate of spread of invasive plants associated with the project area. Rate of spread is typically expressed as a percent and provides critical information for invasive plant management decisions. Defining the annual rate of spread helps to inform necessary treatment levels (acres per year) when designing invasive plant management goals and scope of work. Inventory work within the project area is scheduled to occur during the 2015 and 2016 field seasons.

Resource Indicator Measure

The indicator used for analysis of environmental effects of the alternatives is:

- Predicted increase in acres of noxious weed infestations resulting from proposed activities.

Invasive Plants, Affected Environment

Introduction

Terrestrial Invasive Plants are aggressive and have the potential to spread rapidly across landscapes. The Helena National Forest utilizes the Montana Noxious Weed List (2013) to identify which invasive species to manage across the forest, as well as project specific invasive plant risk assessments (risk assessments). Risk assessments help identify threats to native vegetation as a result of project related ground disturbance and invasive species within or near the project area. They also prescribe mitigation measures to reduce these threats. As project areas are surveyed, new infestations are inventoried. These data are entered into the NRM system, a system of database tools for managing Agency data across the forest. Invasive plant infestation data (spatial and tabular) is stored and can be retrieved for later reference and analyses. NRM has been continually updated with inventoried infestations with a special emphasis on correcting geospatial data through the use of GPS units. For the purposes of this analysis invasive plant inventory data collected over the past 11 years has been summarized to characterize the current condition and trend of invasive plants within the Tenmile – South Helena Project area. The expansion or reduction of existing infestations is affected by non-project related vectors as well as project related impacts. Most notably disturbances created by project activities have the potential to increase the potential of invasive plant introduction and spread.

Disturbance is widely recognized as a primary influence on plant community composition and is frequently implicated in the spread of invasive exotic plants (Hobbs and Humphries 1995). Disturbance is defined as “any relatively discrete event in time that disrupts ecosystem, community, or population structure and changes resources, substrate availability, or the physical environment” (Pickett and White 1985). Parks et al. (2005) examined the patterns of invasive plant diversity in northwest mountain ecoregions and found an overwhelming importance of disturbance in facilitating the establishment of non-native plants. Disturbances can occur as a result natural events such as floods, wind events and animals disturbances. Disturbance can also result from human activities such as construction of roads and trails, livestock grazing, features common to fuel reduction activities such as skid-trails and landings, off-road use of ATV/UTV’s, etc. Fire suppression efforts can also result in disturbances. Fire-line disturbances create suitable conditions for many non-native species to become established (Parks et al. 2005).

At local scales, nonnative invasive species richness and abundance are generally highest in and around disturbed patches, corridors, and edges such as riparian corridors, transportation corridors and fuel treatments (Benninger-Truax et al. 1992, Gelbard and Belnap 2003, Larson 2003). Buckley et al. (2003) found that features common in logged areas such as skid trails and haul roads are likely to support populations and propagules of nonnative plants. Their research also suggests that haul roads, skid trails and main

forest routes serve as primary conduits for entry of introduced species into the interior of managed stands. At regional or landscape scales, richness and abundance of nonnative invasive plants tend to be lower in protected or undeveloped areas than in human-dominated landscapes or landscapes fragmented by human use (Barton et al. 2003). Though, natural disturbance can be a major contributor to increases in invasive species abundance, most of today's weed problems arise from past and present human activities (Hobbs and Humphries 1995).

Analysis Area

Invasive species data was compiled for the Helena Ranger District as well as data specific to the Tennmile - South Helena Project Area (see Figure 86). The Tennmile—South Helena Project area encompasses approximately 61,395 acres in Lewis and Clark, Powell and Jefferson Counties. This includes approximately 49,500 acres of National Forest System Lands (NFS), 1000 acres administered by the Bureau of Land Management (BLM), with the remaining acres being private lands or other jurisdictions. For the purpose of this analysis the spatial bounds direct and indirect effects was the project area boundary. The spatial boundary for cumulative effects was the combo boundary shown in appendix E of the Tennmile – South Helena DEIS was used. The temporal scope for short term and long term are 0 to 5 years and 6 to 20 years respectfully.

The project area is located within the Upper Tennmile watershed, the primary source of municipal water for the City of Helena, and extends east through Colorado Gulch and the South Hills area of Helena, Montana. The proposed action describes activities on NFS lands in Grizzly Gulch, Orofino Gulch, Corral Gulch, Tennmile Creek, Banner Creek, Beaver Creek; and on BLM lands in Colorado Gulch and south of Helena in Last Chance Gulch.

Prior to conducting field surveys, the Region 1 National Forest Invasive Plant Species List was reviewed. Additionally, the Forest Service's Natural Resource Information System (NRIS) invasive species geodatabase was reviewed to determine invasive species known to occur within the Helena Ranger District (see Table 164). Surveys for invasive plants have been previously conducted in the project area but are incomplete.

Table 164. Invasive Plant species known to occur within the Helena Ranger District.

Scientific Name	Common Name
<i>Arctium lappa</i>	greater burdock
<i>Arctium minus</i>	lesser burdock
<i>Berteroa incana</i>	hoary alyssum
<i>Bromus tectorum</i>	cheatgrass
<i>Carduus nutans</i>	musk thistle
<i>Centaurea diffusa</i>	diffuse knapweed
<i>Centaurea stoebe ssp. micranthos</i>	spotted knapweed
<i>Cirsium arvense</i>	Canada thistle
<i>Convolvulus arvensis</i>	field bindweed
<i>Cynoglossum officinale</i>	houndstongue
<i>Euphorbia esula</i>	leafy spurge
<i>Hieracium aurantiacum</i>	orange hawkweed
<i>Hyoscyamus niger</i>	black henbane
<i>Leucanthemum vulgare</i>	oxeye daisy
<i>Linaria dalmatica</i>	Dalmatian toadflax
<i>Linaria vulgaris</i>	butter and eggs
<i>Potentilla recta</i>	sulphur cinquefoil
<i>Sisymbrium altissimum</i>	tall tumblemustard
<i>Tanacetum vulgare</i>	common tansy
<i>Verbascum thapsus</i>	common mullein

Current Condition within the Project Area

A total of 15 invasive plant species were observed within the project area. Table 165 lists the invasive plants observed within the project area and summarizes their state noxious status and the locations and extent of infestations observed. The majority of infestations were observed primarily along roadways, trails and other disturbance areas (e.g. dispersed campgrounds, trailheads, etc.). Figure 86 displays the areas where noxious weeds were observed. Locations of individual plants or patches of infestations were mapped using GPS and are available in the project record. Of the invasive plant species identified in Table 165, dalmation toadflax, spotted knapweed, musk thistle, houndstongue and leafy spurge were the species most commonly observed within the project area.

Table 165. Invasive plant species observed within the project area.

Scientific Name	Common Name	Acres Infested
Arctium minus	lesser burdock	2
Berteroa incana	hoary alyssum	77
Bromus tectorum	cheatgrass	10
Carduus nutans	musk thistle	799
Centaurea stoebe ssp. micranthos	spotted knapweed	1,575
Cirsium arvense	Canada thistle	187
Convolvulus arvensis	field bindweed	2
Cynoglossum officinale	houndstongue	313
Euphorbia esula	leafy spurge	350
Hyoscyamus niger	black henbane	1
Linaria dalmatica	Dalmatian toadflax	2,242
Linaria vulgaris	butter and eggs	5
Potentilla recta	sulphur cinquefoil	329
Tanacetum vulgare	common tansy	3
Verbascum thapsus	common mullein	365
Total Acres Infested		6,261

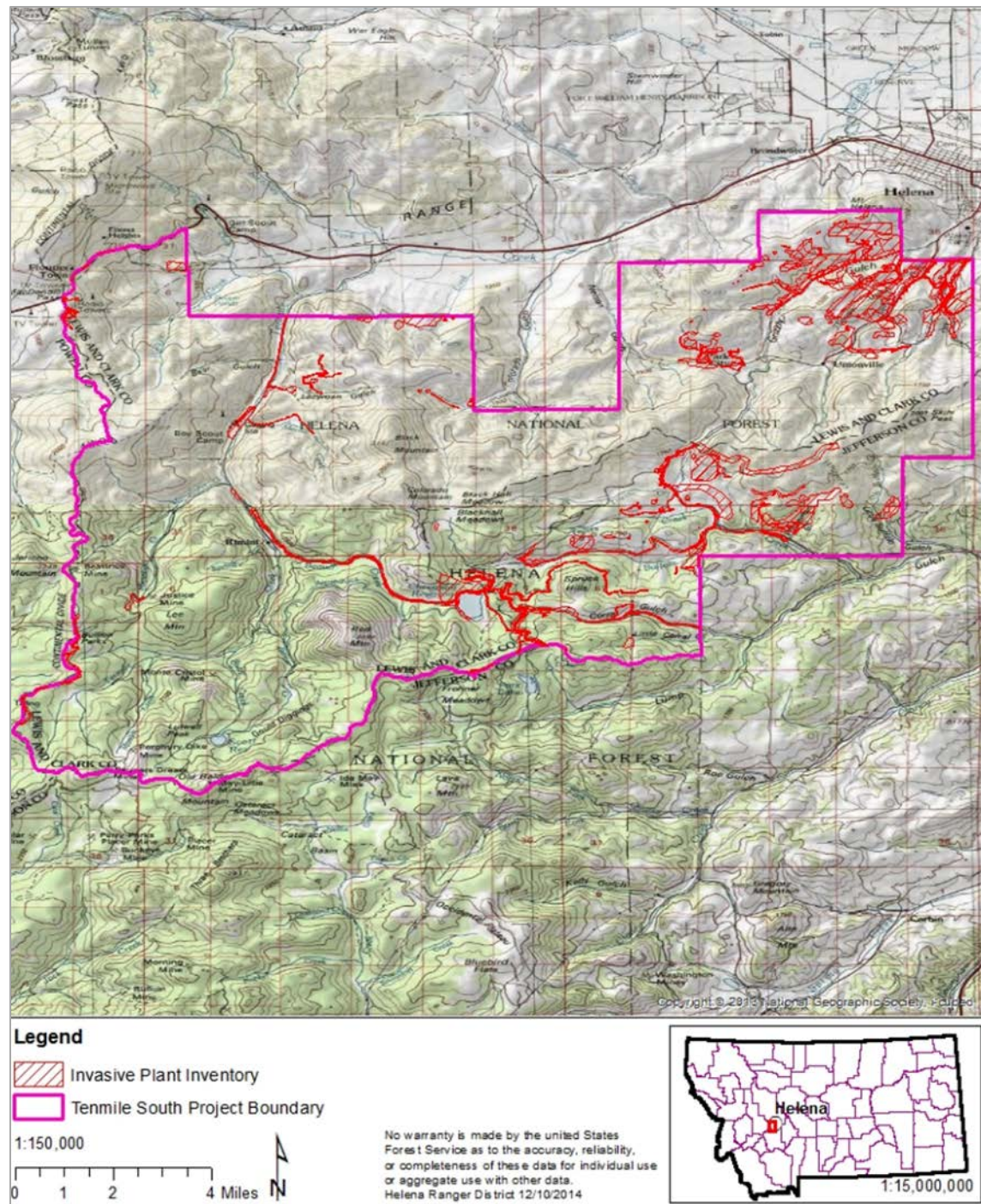


Figure 86. Invasive Plant Inventory.

Invasive Plants, Environmental Consequences

Introduction

Multiple factors can affect a habitat's vulnerability to invasion by non-native plants. Factors that can increase vulnerability to invasion include 1) increased sunlight, 2) exposed or disturbed soils, and 3) proximity to existing infestation or disturbance, such as along roadsides.

Areas with low vulnerability may include a variety of undisturbed habitats in which the ground surface is densely vegetated. Areas with higher vulnerability include habitats that are subjected to soil disturbance combined with high light levels, such as recently logged areas, landslide areas, riparian areas with regular soil disturbance such as alluvial fans and floodplains, and wetlands with water flow-through. The presence of existing invasive plant infestations adjacent to vulnerable habitats further increases the risk of colonization by non-native invasive plants.

The majority of the project area consists of Mid Elevation Warm Dry Forest vegetation types, with lesser portions of the project including lodgepole pine and Mid-High Elevation Cool Moist Forest vegetation types.

Areas with disturbed soils (natural or human caused) that contain or are adjacent to invasive plant infestations have the highest vulnerability to further colonization and expansion of invasive plant infestations. The anticipated level of development and disturbance varies by alternative. Invasive plants are widely distributed throughout the project area but are predominately associated with travel routes (i.e., roads and trails). There are a number of large and small-scale disturbances (e.g., McDonald Pass Wildfire, several recreation trail re-routes, fuels treatments, etc.) that could leave habitats vulnerable to invasive species if they were introduced into the area.

The purposes of the project are to improve conditions for public and firefighter safety across the landscape in the event of a wildfire and to maintain consistent quantity and quality of water within the municipal watershed. In order to achieve these purposes, there is a need to create a mosaic of vegetation and fuel structure more resilient to disturbance which would provide for safer, more effective fire suppression actions. Reducing intensity of wildfires and increase fire suppression effectiveness would improve protection measures for the surrounding communities and key municipal watershed infrastructure. These actions would reduce the probability of post-wildfire watershed impacts in the Tenmile municipal watershed. In addition, sources of anthropogenic sediment to streams need to be addressed in order improve water quality, watershed function, and other resource values in the project area.

Approximately 23,290 acres are proposed for treatment which would include a combination of commercial harvest of trees, non-commercial vegetation treatments and prescribed fire. Mechanical and/or hand treatment methods would be used to accomplish treatment objectives. Analysis of proposed treatment activities on BLM lands will be evaluated in the analysis for the project. Selection of specific treatment methods would be determined as treatment units are refined through public and resource specialist input.

Analysis of the direct, indirect and cumulative effects of the various alternatives considered to address the need for action as they pertain to invasive plants are provided below. The indicator used for analysis of environmental effects of the alternatives is the predicted increase in acres of noxious weed infestations resulting from proposed activities.

Effects Common to All Alternatives

Climate change, fire, grazing, and other disturbances may occur and noxious weed introduction and potential expansion of existing infestations would likely continue regardless of alternative. Existing vectors for the spread of noxious weeds within the project area that are independent of project implementation include existing roads and trails, human vehicle and foot traffic, wildlife use, and wind and water dispersal. Use of existing roads and trails by people and animals provides a source of invasive plant dispersal. Animals may spread noxious weed species through ingesting their seeds or transporting seed on their fur. People may spread noxious weeds along roads and trails by transporting seeds on their shoes, clothing and vehicles (motorized and non-motorized). Road and trail maintenance also has the potential to disperse noxious weeds along the road and trail systems. Many of the noxious weeds present along the road and trail network and other areas in the project area may also spread through wind and water dispersal. There is a moderate risk of exposure of noxious weeds along the existing roadways and trails and a low risk of spread outside roadways and trails due to non-project related vectors. Please refer to Appendices A and B of the Noxious Weeds Report for more information on the risk rating. Noxious weed management activities are likely to continue in and surrounding the project area consistent with direction provided in the HNF Plan (USDA 1986) and the HNF Weed Treatment Project FEIS (USDA 2006).

Effects Common to All Action Alternatives

The spread of noxious weeds would occur under all alternatives. The rate of spread may vary depending on alternative with the potential to be higher in areas proposed for treatments; in particular those areas associated with thinning and burning treatments as well as road decommissioning and road reroutes. Habitat alteration and ground disturbance associated with the various action alternatives would result in an increase in the risk of noxious weed spread or establishment. Habitat alterations that would increase risk include the removal of over story vegetation (i.e., trees) during harvest activities (e.g., improvement harvest, clear-cut with leave trees, pre-commercial thinning, etc.) and temporary clearing of understory vegetation during harvest, prescribed fire and road re-route activities. These activities would result in varying levels of ground disturbance and, potentially, increased sunlight depending on the level of over story vegetation removal.

Ground disturbance associated with harvest activities, prescribed fire (fire lines), temporary road construction and road decommissioning would result in short-term opportunities for noxious weed spread within the project area. Ground disturbance associated with road reroute activities would be more long term due to the fact that the road would not be allowed to revegetate and would remain in place for the foreseeable future. Future activities associated with maintenance of the roads would result in opportunities for noxious weed establishment and spread. The risk associated with habitat alteration and ground disturbance would be temporary in areas that would be allowed to revegetate (e.g., road decommissioning, prescribed fire, etc.). Impacts; however, would be long-term in areas that are kept as bare ground, such as areas associated with road re-routes and areas adjacent to existing roads (such as in roadside ditches). The extent and magnitude of these risks; however, may be mitigated (as discussed in the “Design Criteria/Mitigation” section of this document).

Alternative 1, No Action

Direct/Indirect Effects

The no action alternative provides the resource specialist a means for evaluating the current ecosystem conditions as a baseline. Under the no action alternative, current management plans would continue to guide management of the project area including those associated with noxious weed management. New actions proposed with the Tenmile – South Helena project would not occur. As a result, no new disturbances associated with the action alternatives would occur and the associated risk of noxious weed establishment and spread would not be present. However, existing vectors for the spread of noxious weeds within the project area would continue. Weed management activities would continue to occur as analyzed within the HNF Weed Treatment Project FEIS (USDA 2006). The Specific level of management activities conducted would be subject to funding levels and workload priorities. Additional weed management activities required under the design criteria for the action alternatives would not occur.

Reducing intensity of potential wildfires and increasing fire suppression effectiveness within the project area would not take place. As a result, some indirect effects of the no action alternative may be present associated with an increased risk of high intensity wildfires due to current fuel loads and dynamics. High intensity wildfires have the potential to damage vegetation and soil which could lead to increased weed spread by exposing soil, and reducing competition and canopy cover. Damaged soils result in longer periods for reestablishment by native plant species. Conversely, many invasive plant species have been shown to survive wildfires and are likely to spread throughout the burned areas with the potential to dominate post-fire plant communities (Zouhar 2001). Generally speaking, if a fire occurs in a plant community where nonnative propagules are abundant and/or the native species are stressed, then nonnative species are likely to establish and/or spread in the postfire environment (Zouhar et al. 2001).

Irreversible/Irretrievable Commitments

Noxious weeds have the potential to negatively impact public and private lands. Effects can come in the form of reduced biodiversity, a weakened ecosystem, a higher propensity for soil erosion, limited forage resources for wildlife and livestock and degraded wildlife habitat. These potential effects are common to all alternatives due to the fact that noxious weed introduction and spread is anticipated independent of new disturbance levels. This is a result of existing vectors for the spread of noxious weeds within the project area that are expected to continue for the reasonably foreseeable future. If noxious weed management does not take place, the effects resulting from uncontrolled noxious weed infestations could be irretrievable if infestations increase to a point of drastically impairing ecological health and associated resources and to a level that is impractical to treat with available resources (i.e., time and funding). However, if noxious weed management continues as described in the HNF Weed Treatment Project FEIS (USDA 2006), the reduction in the size and abundance of existing infestations and prevention of new infestations would occur resulting in recovery of affected lands and no known irreversible effects as a result of noxious weed infestations would be anticipated to occur.

Cumulative Effects

New actions proposed with the Tennmile – South Helena project would not occur under the no action alternative. However, as discussed under Direct and Indirect Effects for alternative 1 as well as under Effects Common to All Alternatives, there are effects that could result from no action being taken. The direct and indirect effects identified could add incrementally to the introduction and spread of noxious weeds within the analysis area when combined with the effects from past, present and reasonably foreseeable future actions. Noxious weed management efforts (e.g., herbicide treatment, biological control, etc.) aid in the control and/or reduction of existing noxious weed infestations and prevention of new infestations becoming established. The cumulative effects study area (CESA) considered in this analysis is the combo boundary described as Appendix C of the DEIS. The current condition within the cumulative effects study area (CESA) is the product of past habitat alteration and disturbances as well as the results of previous noxious weed management actions. For a complete list of past, present and reasonably foreseeable future actions please refer to the cumulative effects master table included as Appendix C. Cumulative Effects to the Tennmile – South Helena Project DEIS.

Some of the more notable past and present activities that present the greatest potential to impact noxious weeds within the CESA include the following:

- Noxious Weed Management actions continue to occur Forest-wide in accordance with direction provided within the HNF Weed Treatment Project FEIS (USDA 2006).
 - Weed management actions have the potential to reduce the spread and establishment on noxious weeds within and surrounding the project area. These actions would tend to limit or mitigate the effects of habitat alteration or disturbance associated with other activities.
- Existing activities such as livestock grazing, recreation use and vehicle use on trail and road systems have the potential to spread noxious weed seeds and serve as vectors for the introduction and establishment of new infestations to areas alongside and away from roads and trails.
 - Livestock grazing would continue on 10 grazing allotments within the CESA boundary area (please refer to Appendix B. Cumulative Effects to the Tennmile – South Helena Project DEIS for the complete list of associated grazing allotments).
- Habitat alteration, ground disturbance and vehicle use associated with the following projects would likely continue to pose a risk of noxious weed introduction and spread within the CESA (please refer to Appendix B. Cumulative Effects to the Tennmile – South Helena Project DEIS for details on the listed projects):
 - Red Mountain Flume/Chessman Reservoir Project.
 - Routine Use and Maintenance of Non-motorized Forest Trails.
 - Power Utilities, Phone Utilities, Yellowstone Gas Pipeline, & Touch America Fiber Optic Lines.
 - 10-Mile EPA Reclamation.
 - Clancy Unionville Vegetation Manipulation and Travel Management Project.

- Travis Creek Power Line Relocation.
- BLM – Clancy area Hazardous Fuels Reduction Project.
- Northwestern Energy Powerline hazard tree removal.
- EPA- Luttrell Repository.
- Personal use firewood cutting.
- Timber harvest on private and state lands.

Reasonably foreseeable activities that could affect sensitive plants or their habitats are also addressed in Appendix B to the Tennmile - South Helena Project DEIS. The major activities and their expected effects are summarized below:

- Telegraph Vegetation Project. This project would treat approximately 6,300 acres with a combination of pre-commercial thinning, timber harvest and prescribed fire. Up to 8 miles of new temporary road would be built. There are known populations of noxious weeds in this project area. Those populations have been identified and design criteria directing noxious weed management actions would be applied to address the potential for noxious weed introduction and spread.

Alternative 2, Proposed Action

The proposed action is designed to maximize the opportunity to meet the purpose and need of improving conditions for public and firefighter safety across the landscape in the event of a wildfire. Alternative 2 does this by proposing the largest number of acres treated (see Table 166 below), thereby providing the greatest change in fuel structures and creating large-areas of vegetation mosaics.

Table 166. Alternative 2 proposed treatments.

Vegetation Treatment	Acres
Improvement Harvest	2,071
Clearcut with Leave Trees	3,573
Seed Tree with Leave Trees	298
Shelterwood with Leave Trees	130
Shaded Fuel Break	1,415
Low Severity Prescribed Fire	11,527
Mixed Severity Prescribed Fire	1,714
Private Land Buffers	2,091
Precommercial Thin	471
Total	23,290 acres

Direct/Indirect Effects

Disturbance is widely recognized as a primary influence on plant community composition and is frequently implicated in the spread of invasive exotic plants (Hobbs and Humphries 1995). Disturbance is defined as “any relatively discrete event in time that disrupts ecosystem, community, or population structure and changes resources, substrate availability, or the physical environment” (Pickett and White 1985). Parks et al. (2005) examined the patterns of invasive plant diversity in northwest mountain ecoregions and found an overwhelming importance of disturbance in facilitating the

establishment of non-native plants. Disturbances can occur as a result natural events such as floods, wind events and animals disturbances. Disturbance can also result from human activities such as construction of roads and trails, livestock grazing, features common to fuel reduction activities such as skid-trails and landings, off-road use of ATV/UTV's, etc. Fire suppression efforts can also result in disturbances. Fire-line disturbances create suitable conditions for many non-native species to become established (Parks et al. 2005).

At local scales, nonnative invasive species richness and abundance are generally highest in and around disturbed patches, corridors, and edges such as riparian corridors, transportation corridors and fuel treatments (Benninger-Truax et al. 1992, Gelbard and Belnap 2003, Larson 2003). Buckley et al. (2003) found that features common in logged areas such as skid trails and haul roads are likely to support populations and propagules of nonnative plants. Their research also suggests that haul roads, skid trails and main forest routes serve as primary conduits for entry of introduced species into the interior of managed stands. At regional or landscape scales, richness and abundance of nonnative invasive plants tend to be lower in protected or undeveloped areas than in human-dominated landscapes or landscapes fragmented by human use (Barton et al. 2003).

The specific direct effects associated with alternative 2 are similar to those described under Effects Common to All Action Alternatives. The principle direct effects associated with alternative 2 would be the result of the habitat alteration and ground disturbing activities described in Table 166 above and vehicle and equipment use associated with the project.

Noxious weed introduction and spread is expected within areas associated with habitat alteration and ground disturbance, in particular those areas where thinning and burning treatments as well as road decommissioning and road reroutes would occur. Habitat alternation and ground disturbance associated with the various vegetation treatments would result in an increase in the risk of noxious weed spread or establishment. Habitat alterations that would increase risk include the removal of over story vegetation (i.e., trees) during harvest activities (e.g., improvement harvest, clear-cut with leave trees, pre-commercial thinning, etc.) and temporary clearing of understory vegetation during harvest, prescribed fire and road re-route activities. These activities would result in varying levels of ground disturbance and, potentially, increased sunlight depending on the level of over story vegetation removal.

Ground disturbance associated with harvest activities, prescribed fire (fire lines), temporary road construction and road decommissioning would result in short-term opportunities for noxious weed spread within the project area. Ground disturbance associated with road reroute activities would be more long term due to the fact that the road would not be allowed to vegetate and would remain in place for the foreseeable future. Future activities associated with maintenance of the roads would result in opportunities for noxious weed establishment and spread.

The risk associated with habitat alteration and ground disturbance would be temporary in areas that would be allowed to revegetate (e.g., road decommissioning, prescribed fire, etc.). Impacts; however, would be long-term in areas that are kept as bare ground, such as areas associated with road re-routes and areas adjacent to existing roads (such as in

roadside ditches). The extent and magnitude of these risks; however, may be mitigated (as discussed in the “Design Criteria/Mitigation” section of this document).

Given the above, the predicted increase in acres of potential noxious weed infestation resulting from soil disturbance associated with proposed activities under alternative 2 would be (15 percent of total acres treated): 3,494 acres. Additional increase in acres of potential noxious weed infestation is anticipated due to other treatment activities resulting in habitat alterations (example: reduced canopy density).

The indirect effects associated with alternative 2 could result in a lower risk of weed spread in the future if the proposed action is successful in reducing the intensity of wildfires and increasing fire suppression effectiveness within the project area. High intensity wildfires have the potential to damage vegetation and soil which can lead to increased weed spread by exposing soil, and reducing competition and canopy cover. Damaged soils result in longer periods for reestablishment by native plant species while many invasive plant species being able to survive wildfires and are likely to spread throughout the burned areas with the potential to dominate post-fire plant communities (Zouhar 2001). Removing future risk and/or likelihood of high intensity fires within the project area would indirectly lower the risk of noxious weed spread and establishment within the project area in out years.

Irreversible/Irretrievable Commitments

There would be no irreversible or irretrievable commitments under alternative 2. Although proposed activities would increase the susceptibility of some treatment areas to noxious weed introduction and spread, the design criteria and mitigation measures that involve weed treatment before and after project implementation would reduce the size and density of weed infestations. This would reduce the effects of noxious weed infestations and would not allow infestations to increase to a point of drastically impairing ecological health and associated resources or to a level that is impractical to treat with available resources (i.e., time and funding).

Cumulative Effects

As discussed in the Direct and Indirect Effects section for alternative 2, the habitat alteration and ground disturbing activities as well as the vehicle and equipment use associated with the project would increase the potential for noxious weed spread and establishment within the project area. The effects would principally occur within the treatment units and along access routes. The direct and indirect effects identified could add incrementally to the introduction and spread of noxious weeds within the analysis area when combined with the effects from past, present and reasonably foreseeable future actions. The indirect effects of implementing alternative 2 could result beneficial cumulative effects over the long term. This is due to the fact that the proposed treatments are designed to reduce fuel loading and modify the fuel dynamics within the project area with a goal of reducing the intensity of wildfires and increasing fire suppression effectiveness within the project area. If successful the project has the potential to limit the adverse effects of wildfire within the project area. The adverse effects associated with wildfire in regards to noxious weeds would be expected to be less under alternative 2 than under alternative 1.

Noxious weed management efforts (e.g., herbicide treatment, biological control, etc.) aid in the control and/or reduction of existing noxious weed infestations and prevention of new infestations becoming established. The current condition within the cumulative effects study area (CESA) is the product of past habitat alteration and disturbances as well as the results of previous noxious weed management actions. For a complete list of past, present and reasonably foreseeable future actions please refer to the cumulative effects master table included as Appendix B. Cumulative Effects to the Tennmile – South Helena Project DEIS.

Some of the more notable past and present activities that present the greatest potential to impact noxious weeds within the CESA include the following:

- Noxious Weed Management actions continue to occur Forest-wide in accordance with direction provided within the HNF Weed Treatment Project FEIS (USDA 2006).
 - Weed management actions have the potential to reduce the spread and establishment on noxious weeds within and surrounding the project area. These actions would tend to limit or mitigate the effects of habitat alteration or disturbance associated with other activities.
- Existing activities such as livestock grazing, recreation use and vehicle use on trail and road systems have the potential to spread noxious weed seeds and serve as vectors for the introduction and establishment of new infestations to areas alongside and away from roads and trails.
 - Livestock grazing would continue on 10 grazing allotments within the analysis area (please refer to Appendix B. Cumulative Effects to the Tennmile – South Helena Project DEIS for the complete list of associated grazing allotments).
- Habitat alteration, ground disturbance and vehicle use associated with the following projects would likely continue to pose a risk of noxious weed introduction and spread within the CESA (please refer to Appendix B. Cumulative Effects to the Tennmile – South Helena Project DEIS for details on the listed projects):
 - Red Mountain Flume/Chessman Reservoir Project.
 - Routine Use and Maintenance of Non-motorized Forest Trails.
 - Power Utilities, Phone Utilities, Yellowstone Gas Pipeline, & Touch America Fiber Optic Lines.
 - 10-Mile EPA Reclamation.
 - Clancy Unionville Vegetation Manipulation and Travel Management Project.
 - Travis Creek Power Line Relocation.
 - BLM – Clancy area Hazardous Fuels Reduction Project.
 - Northwestern Energy Powerline hazard tree removal.
 - EPA- Luttrell Repository.
 - Personal use firewood cutting.
 - Timber harvest on private and state lands.

Reasonably foreseeable activities that could affect sensitive plants or their habitats are also addressed in Appendix B to the Tennile – South Helena Project DEIS. The major activities and their expected effects are summarized below:

- Telegraph Vegetation Project. This project would treat approximately 6,300 acres with a combination of pre-commercial thinning, timber harvest and prescribed fire. Up to 8 miles of new temporary road would be built. There are known populations of noxious weeds in this project area. Those populations have been identified and design criteria directing noxious weed management actions would be applied to address the potential for noxious weed introduction and spread.

Alternative 3

Alternative 3 is designed in response to issues presented in both internal and external scoping comments about potential treatment effects on Inventoried Roadless Areas, wildlife, and recreationist values associated with the numerous trail systems in the project area. Alternative 3 has the following design elements that differentiate the actions proposed from alternative 2:

- No mechanized treatment or commercial harvest within IRAs; the exception to this is mechanized treatments would be allowed within private buffer units.
- Minimize treatments within existing elk security areas.
- Limit mechanical equipment on existing non-motorized trails.
- Retain the existing green islands of trees to the extent possible, especially near elk security areas.
- Reduce overall treatments within IRAs.
- Reduce and/or minimize new road construction.

Direct/Indirect Effects

The direct and indirect effects associated with alternative 3 are similar to those described under alternative, proposed action, with the exception that they would be slightly less due to less overall habitat alteration and disturbance across the project area. However, the slight difference in affects are expected to be negligible and not divergent enough from those described under alternative 2 to warrant a separate discussion of effects associated with alternative 3. The lower levels of habitat alteration and disturbing activities are a result in the aforementioned design elements that differ from those associated with alternative 2. The following tables display the differences in total acres associated with vegetation treatments as well as miles associated with road management, both of which contribute to the risk of noxious weed introduction and spread within the project area:

Table 167. Comparison of vegetation treatment acreages and number of units for alternatives 2 and 3.

Vegetation Treatment	Alternative 2 (Proposed Action) Acres	Alternative 2 Number of Units	Alternative 3 Acres	Alternative 3 Number of Units
Improvement Harvest	2,071	43	1,382	23
Clearcut with Leave Trees	3,573	41	2,348	19

Vegetation Treatment	Alternative 2 (Proposed Action) Acres	Alternative 2 Number of Units	Alternative 3 Acres	Alternative 3 Number of Units
Seed Tree with Leave Trees	298	3	0	0
Shelterwood with Leave Trees	130	2	102	2
Shaded Fuel Break	1,415	10	1,282	8
Low Severity Grassland Prescribed Fire	0	0	1,661	9
Low Severity Prescribed Fire	11,527	106	6,952	76
Mixed Severity Prescribed Fire	1,714	10	656	4
Private Land Buffers	2,091	45	2,265	43
Precommercial Thin	471	18	445	16
Total acres	23,290	278	17,094	200

Table 168. Comparison of road management for alternatives 2 and 3

Road Management	Alternative 2 – Proposed Action (miles)	Alternative 3 (miles)
FS New Temporary Road Construction	39	21
BLM New Temporary Road Construction	4	3
Roads Decommission	16	16
Roads Reconstruction	32	28

Given the above, the predicted increase in acres of potential noxious weed infestation resulting from soil disturbance associated with proposed activities under alternative 3 would be (15 percent of total acres treated): 2,564 acres. Additional increase in acres of potential noxious weed infestation is anticipated due to other treatment activities resulting in habitat alterations (example: reduced canopy density).

Irreversible/Irretrievable Commitments

There would be no irreversible or irretrievable commitments under alternative 3. The rationale for alternative 3 is the same as described under alternative 2.

Cumulative Effects

The cumulative effects associated with alternative 3 are similar to those described under alternative 2 proposed action with the exception that they would be slightly less due to less overall habitat alteration and disturbance across the project area. However, the slight difference in affects are expected to be negligible and not divergent enough from those described under alternative 2 to warrant a separate discussion of effects associated with alternative 3.

Conclusions

Alternative 1

Under the no action alternative, current management plans would continue to guide management of the project area including those associated with noxious weed management. New actions proposed with the Tennile – South Helena project would not occur. As a result, no new disturbances associated with the action alternatives would occur and the associated risk of noxious weed establishment and spread would not be present. Forest Service Manual (FSM) 2900 (USDA Forest Service 2011), only requires the development of a risk assessment as part of an environmental analysis for ground-disturbing activities. As a result, a risk assessment was not conducted for alternative 1.

No direct effects to noxious weeds would be expected to occur under alternative 1. However, indirect effects associated with lack of action could occur due to the risk of high intensity wildfires that may result from the current fuel loads and dynamics within the project area. Effects associated with high intensity wildfires could result in increased weed spread and establishment within post fire vegetation communities. Also of note is that additional weed management activities required under the design criteria for the action alternatives would not occur.

Alternatives 2 and 3

A majority of the proposed treatments described within alternatives 2 and 3 are within mid elevation warm dry forest habitat types (e.g., Douglas fir, ponderosa pine, etc.). The dominant noxious weed species present within and near the project area are not considered to be highly invasive within mid elevation warm dry forest habitat types. This along with additional data described below was utilized to analyze the direct, indirect and cumulative effects associated with alternatives 2 and 3.

An invasive plant risk evaluation was conducted to determine the level of risk of invasion and/or increased infestation of invasive plant species as a result of habitat alteration and ground disturbing activities associated with both action alternatives. Four factors were considered when assigning an overall risk rating to each of the action alternatives. The four factors include susceptibility, threat, disturbance and exposure. Two of the factors (susceptibility and threat) have been combined into a composite factor titled "overall invasiveness rating". A description of each factor is provided below:

- **Susceptibility** - For the purposes of the risk evaluation susceptibility refers to the vulnerability of a project area to invasion, colonization and establishment of invasive plants. Susceptibility is based on data compiled by Maria Mantis. Mantis (2003) made a susceptibility determination for each species for each potential natural vegetation type (PNV). Four susceptibility categories were used to rate each species. The categories included; U = Unknown (susceptibility of PNV to the species is unknown), C = Closed (the species generally does not occur within this PNV), I = Invasive (The species is invasive in undisturbed conditions within this PNV. If a species is rated as I then it is assumed that it would also invade with disturbance), D = Disturbance (The species occurs in this PNV where there has been evidence of recent disturbance).

- Threat - For the purposes of the risk evaluation threat refers to the degree of change to the structure, composition, or function of a native community from an invasive plant. Threat is based on data compiled by Mantis (2003). Four threat classes were used to rank invasive plant species. The classes included; L = Low Threat (Species can become established; however, they do not compete well with native vegetation, even in disturbed settings), H = High Threat (Species can compete successfully with native vegetation once they become established, changes to the plant community would be significant leading to an alteration of the species composition and associated pathways of succession, fire regime, canopy cover, etc.), N = No Threat (A species can only be assigned N if the PNV is rated as closed for susceptibility to that particular species), U = Threat Unknown.

The aforementioned susceptibility and threat categories developed by Mantis (2003) and the invasive plant species associated with them were sorted and merged to create three "Species Invasiveness" categories. The three species invasiveness categories are High, Low and Neutral. The invasive plant species associated with each of the three categories are based on the preponderance of the susceptibility and threat ratings completed for each species by Mantis (2003). Site specific information associated with the project (e.g., invasive plant species present or near the project, planned disturbance, etc.) was taken into account with specific consideration/weight given to dominant habitat types within the project area.

The probability of exposure is a function of a projects location in relation to road density, high traffic areas, and range allotments. The probability of exposure to invasive plants was adapted from data compiled by Mantis (2003) and a scoring system applied to quantify each level of probability. The three exposure categories include road density, high traffic areas (i.e., primary and secondary highways) and active grazing allotments. The scores assigned for Road density, high traffic areas and active and recently active grazing allotments were combined to assign an overall invasive plant exposure rating for the project.

The overall Invasive plant Risk Rating was then calculated for each alternative using the three factors described above (i.e., susceptibility, threat and exposure) Susceptibility and threat are combined into the Species Invasiveness composite category. The two ratings (species invasiveness and overall invasive plant exposure) are then combined to calculate the overall risk rating for the alternative. This process is repeated for each action alternative.

The overall invasive plant risk rating was calculated as being low for both alternatives 2 and 3. This is due to the fact that the dominant invasive species present both inside the project area and within ½ mile of the project boundary are considered to have a low invasiveness rating associated with the dominant habitat group within the project area. The overall probability of exposure associated with each alternative is considered to be moderate as a result of the road density, high traffic rating and presence of active grazing allotments within and around the project area.

In summary direct effects of both alternatives are anticipated to contribute to noxious weed introduction and spread, however the risk of those effects are expected to be low

due to the noxious weed species present and the overall probability of exposure. The effects would be mitigated by implementing the design criteria and mitigation measures described in the “Design Criteria/Mitigation” section of this document.

Forest Plan Consistency

The effects upon noxious weeds associated with alternatives 2 and 3 would remain within Forest Plan standards because it is consistent with management guidelines with the design criteria implemented. There are no specific management area standards for noxious weed management in the Forest Plan. This document tiers to the decision in the Noxious Weed EIS and ROD which prescribes specific guidance for noxious weed management on the HNF.

The project is consistent with the “weed” portion of the Forest Plan forest-wide management areas standards.

Soils

Introduction

The purposes of the Tennile - South Helena project are to maintain consistent quantity and quality of water within the municipal watershed, improve overall forest health, and increase safety for the public and fire personnel across the landscape in the event of a wildfire. In order to achieve these purposes, there is a need to create a mosaic of vegetation and fuel structure more resilient to disturbance than the present condition. This would provide for safer, more effective fire suppression actions, as well as improve protection measures for the surrounding communities and municipal watershed infrastructure. The probability of post-wildfire watershed impacts in the Tennile municipal watershed would be reduced. In addition, anthropogenic sources of sediment to streams need to be addressed in order to improve water quality, watershed function, and other resource values in the project area.

Landtypes (soils) have been characterized for the Tennile - South Helena Project area in Soil Survey of Helena National Forest Area, Montana (USDA FS and NRCS 2001) and the Soil Survey of Lewis and Clark County, Montana (USDA NRCS 2003). There are 62 soil units mapped within the project area. A summary of key soil characteristics for the project area landtypes are displayed in Table 169, Table 171, and Table 179

By including all design features and Resource Protection Measures specified in the action alternatives, proposed actions for the Tennile - South Helena Project would comply with Region 1 Soil Quality Standards (R1 SQS) to limit detrimental soil disturbance.

Under alternative 2, proposed units listed in Table 175 are anticipated to comply with R1 SQS with implementation of additional design features. Those design features are spelled out under the appropriate activities for this alternative. The remainder of the units not listed in Table 175 would comply with R1 SQS as proposed.

Under alternative 3, proposed units listed in Table 176 are anticipated to comply with R1 SQS with additional design features. Those design features are spelled out under the

appropriate activities for this alternative. The remainder of the units not listed in Table 176 would comply with R1 SQS as proposed.

Detrimental soil disturbance would be a short-term impact because there would be a long-term trend for soil recovery through reclamation measures and/or natural recovery processes (i.e. frost heave bio-perturbation, biomass input and nutrient cycling, etc.). Soils may take at least 50 years for recovery to pre-disturbance conditions where reclamation measures (scarification and seeding) would be implemented, such as on temporary roads, skid trails and log landings. Soils would likely take longer to recover to pre-disturbance conditions, perhaps at least 100 years, where only natural recovery processes would occur.

Nonetheless, all proposed actions for the Tenmile - South Helena Project have been designed to comply with R1 SQS to limit the area affected by detrimental soil disturbance through inclusion of Resource Protection Measures and design features in all action alternatives. A full listing of Resource Protection Measures which would be implemented with all action alternatives can be found in the section of this report titled, “Design Criteria”.

All BLM proposed actions are anticipated to comply with LRMP (Land Resource Management Plan) guidance.

Assumptions

USFS

Ground Based Harvest/Precommercial Thin (Ground Based)/Mechanical Rearrangement of Fuels

Predictions of detrimental soil disturbance (DSD) are based on calculations of skid trail disturbance and have been validated by monitoring conducted on the Helena National Forest (USDA FS 2013). It is assumed that the magnitude of soil disturbance on areas affected by primary skid trails would constitute detrimental soil disturbance. The average spacing between skid trails in tractor harvest units is estimated to be 100 feet except where they converge. With an average width of detrimental soil disturbance at 10-feet, main skid trails would affect about 9.1% of the activity area in a tractor harvest unit logged during “summer conditions”. This is calculated using the following equation:

$$\% \text{ DSD} = \text{width of the skid trail in feet} / [(\text{width of skid trail in feet}) + \text{width of spacing between main skid trails in feet}] \times 100$$

$$9.1\% = 10 \text{ ft.} / (10 \text{ ft} + 100 \text{ ft.}) \times 100$$

Monitoring conducted on the Helena National Forest in 2012 documented 7 percent detrimental soil disturbance on units that were logged with ground based equipment (tractor) during “summer conditions” (FY2012 Soil Monitoring Report). For logging under “frozen conditions”, the amount of area impacted by log skidding is predicted to be between 3 percent – 4 percent of the activity area based on monitoring conducted on the Helena National Forest (USDA FS 2013).

Log Landings Associated with Ground Based Harvest

The average size of log landings is estimated ¼ acre (0.25 acres) for tractor logging units. It is assumed that one quarter of an acre log landing is needed for every 10 acres of harvested area. It is assumed that the magnitude of soil disturbance on the areas affected by log landings would constitute detrimental soil impacts. By calculating the detrimental disturbance with the following equation:

$$\% \text{ DSD} = [(\text{area of log landing in acres}) \div (\text{amount of harvested area per log landing in acres})] \times 100$$

$$2.5\% = [.25 \div 10] \times 100$$

The detrimental soil disturbance associated with log landings is 2.5 percent which was validated by monitoring conducted on the Helena National Forest (USDA FS 2013).

Cable Yarding Harvest

Predictions of detrimental soil disturbance (DSD) are based on calculations of cable corridor disturbance. It is assumed that the magnitude of soil disturbance on the areas affected by cable yarding corridors would constitute detrimental soil disturbance. The average spacing between skid trails in tractor harvest units is estimated to be 100 feet except where they converge. With an average width of soil disturbance at 8-feet, main cable yarding corridors would affect about 7 percent of the activity area. This is calculated using the following equation:

$$\% \text{ DSD} = \text{width of the skid trail in feet} \div [(\text{width of skid trail in feet}) + \text{width of spacing between main skid trails in feet}] \times 100$$

$$7.2\% = 8 \text{ ft.} \div (10 \text{ ft.} + 100 \text{ ft.}) \times 100$$

Soil monitoring in the Maudlow-Toston salvage sale area found that detrimental soil disturbance in cable yarding corridors affected approximately 4–5% of units when harvest occurred under summer conditions (USDA FS 2003a, 2003b, 2003c, 2003d).

While monitoring shows a resulting detrimental soil disturbance of 4 to 5 percent for summer cable yarding, the estimate based on mathematical design criteria is 7.2 percent.

Monitoring observations within cable units harvested under winter conditions, documented that detrimental soil disturbance was negligible (i.e. not enough to be measurable) in the Maudlow-Toston Area. With this in mind, a 2 percent detrimental soil disturbance estimate is anticipated from this activity. Winter cable log yarding methods have less impact to soils compared to tractor skidding over bare ground (USDA FS 2013).

Log Landings Associated with Cable Yarding Harvest

With cable yarding systems, log landings would generally be located on the shoulder of the road used to access the harvest unit. Because the cable yarding equipment would be set-up and operating on the access road prism, there would not be soil impacts from heavy equipment on the log landing sites. Therefore, detrimental soil impacts would be negligible in the log landing sites for cable yarding units (USDA FS 2012).

Prescribed Fire

There are several activities that have varying effects on soils in the prescribed fire category. For all of the burning prescriptions described below, it is assumed that the percent of severely burned soil equates to the percent detrimental soil disturbance.

Slashing is assumed to have no detrimental soil disturbance as a result of mechanical (chainsaw) cutting of small diameter trees by personnel on foot.

Pile burning focuses on a concentration of fuel accumulations in piles and high severity fire would occur in these piles. Monitoring conducted on the Helena National Forest documented that pile burning within units resulted in 0 to 3 percent detrimental soil disturbance (USDA FS 2013). Detrimental soil disturbance associated with pile burning could be as much as 5 percent depending on the concentration of the piles within the activity area. Therefore the amount of detrimental soil disturbance associated with pile burning is predicted to be 5 percent (USDA FS 2013).

Jackpot burning focuses on concentrations of natural fuel accumulations and/or slash after harvest or slashing. High severity fire would occur in the heavy fuel concentration burning locations; however this is predicted to affect no more than 5 percent of an activity area when considering the project design elements. Therefore the detrimental soil disturbance associated with jackpot burning is predicted to be 5 percent.

Broadcast burning is designed to reduce hazardous fuels and includes areas of low severity burn and mixed severity burning. When estimating soil effects resulting from prescribed burning, specifically mixed severity burning, occasionally burn plans would be designed to target the low end of mixed severity fire to ensure adequate soil cover is retained to guard against erosion in excess of 2 tons/acre. Mixed severity burning is designed to expose 5 to 25 percent bare soil. Targeting the low end of mixed severity burning would be designed to expose 5 to 10 percent bare soil. It is assumed that less than 2 percent of the area affected by a low severity fire would be severely burned and less than 10 percent of the area affected by a moderate severity fire would be severely burned (DeBano et al. 1998). Therefore a range of 2 to 10 percent detrimental soil disturbance is associated with broadcast burning (USDA FS 2013, 2014b).

Under burning is a low severity fire covering a majority of an activity area. Monitoring conducted on the Helena National Forest documented that detrimental soil disturbance following under burning averaged 4 percent (USDA FS 2013, 2014b).

All of these estimates are based on monitoring of similar activities across the Helena National Forest, occurring on similar landscapes; along with professional observation and experience in the field. Temporary Road Construction

For the purpose of calculating predicted area of detrimental soil disturbance resulting from temporary road construction and subsequent obliteration, estimates were made for average widths of temporary roads (25 feet). This includes the width of disturbance created by cut and fill slopes. With a width of 25 feet, 1 mile of temporary road construction would equal 3 acres of detrimental soil disturbance.

$$3 \text{ acres} = [(1 \text{ mile} \times 5280 \text{ feet/mile}) \times 25 \text{ feet}] / 43,560 \text{ sq. feet/acre}$$

Road Decommissioning

For the purpose of calculating predicted area of recovery to productive land base for decommissioned roads, estimates were made for average widths of temporary roadways (25 feet). This includes width of disturbance includes the area affected by cut and fill slopes. With a width of 25 feet, 1 mile of road decommissioning would equal 3 acres of soil restoration.

$$3 \text{ acres} = [(1 \text{ mile} \times 5280 \text{ feet/mile}) \times 25 \text{ feet}] / 43560 \text{ sq. feet/acre}$$

Information Used

The “Soil Survey of Helena National Forest Area, Montana” (USDA FS and NRCS 2001) and the “Soil Survey of Lewis and Clark County, Montana” (USDA NRCS 2003) provide information on distribution of mapped soil units, which are termed landtypes, within the project area. This published “Soil Survey” meets National Cooperative Soil Survey Standards, and includes descriptions of soil types and their characteristics relevant to management activities.

To estimate predicted detrimental soil disturbance based on proposed activities for cumulative effects analysis and regulatory compliance, several documents were used which are filed in the following location (as updated):

O:\NFS\Helena\Project\TenmileSouthNEPA\Documents and
T:\FS\NFS\Helena\Project\TenmileSouthNEPA. This analysis uses results of soil monitoring, conducted in the Maudlow Toston Salvage Sale Area and Cave Gulch Salvage Sale Areas (USDA FS 2003a, 2003b, and 2003c, 2003d; Page-Dumroese et al. 2006), to evaluate implementation and effectiveness of Best Management Practices (BMPs). Additionally, annual monitoring data across the Helena National Forest has occurred for similar activities on similar landtypes, aspects and positions employing the same or similar resource protection measures are most recently summarized in the FY2012 Soil Monitoring Report, which can be found in the soil project record (USDA FS 2013). Other sources of information for evaluating effectiveness of BMPs are cited in this analysis.

A variety of published scientific literature, relating to soils, and effects of timber harvest and prescribed fire, were reviewed for supporting information in this analysis. Literature reviewed for this analysis is listed in a bibliography at the end of this report.

Methodology

The Helena National Forest uses the Forest Soil Disturbance Monitoring Protocol (Page-Dumroese et al. 2009) to monitor forest sites before and after ground disturbing management activities for physical attributes that could influence long-term sustainability and hydrologic function. Monitoring of surface cover, ruts, compaction, and platy structure, for example, can also be used to generate best management practices that help maintain site productivity.

The Helena National Forest uses this protocol when evaluating physical soil disturbance in a forested setting to determine compliance with the Region 1 Soil Quality Standards (USDA FS 2014a) and the Helena National Forest Plan. These soil guidelines are to be

applied for design and evaluation of management activities to ensure soil function and processes are maintained as outlined in FSM 2550 and FSH 2509.

Field work was conducted in 2013 and 2014 to document the existing detrimental soil disturbance in the majority of units that were proposed for mechanical entry and with past harvest activity. All employees are qualified to follow the sampling design strategy, rate the magnitude of soil disturbance based upon regional and national guidance as a result of comprehensive training from previous HLCNF Soil Scientists David Marr and Autumn Coleman. This methodology provides a conservative assessment of existing soil conditions (Page-Dumroese et al. 2009). Informal comparisons found that for both single observers and between observers, category calls in this methodology have a variability of 5 percent. This level of survey leads to roughly a 90 to 95 percent confidence with error bars from 5 to 8 percent, depending on the amount of disturbance found. Thus, the surveys achieve statistical inference for units with either low disturbance (less than 7 percent) or moderately high disturbance (greater than 23 percent) (Page-Dumroese et al. 2009).

The loss of surface organic matter can cause nutrient and carbon cycle deficits and negatively affect soil properties. The direct benefits of coarse woody material to soils can vary widely, depending on ecological type. Research guidelines such as those contained in Graham et al. 1994, should be used if more specific local guidelines are not available. These soil guidelines are to be applied for design and evaluation of vegetation management activities.

Coarse woody debris measurements were performed in all units where DSD was monitored. This protocol is consistent with the methods used by the Timber Sale Administration Staff to determine compliance with residual coarse woody debris following the completion of the activity area.

Rills, gullies, pedestals and soil deposition are all indicators of detrimental surface erosion. Minimum amounts of ground cover necessary to keep soil loss to within tolerable limits (generally less than 2 tons per acres per year) should be established locally depending on site characteristics. Erosion modelling with the Water Erosion Prediction Project (WEPP) technology was completed for project activities and is included in the Hydrology Specialist Report. WEPP simulates both inter-rill and rill erosion processes and incorporates the processes of evapotranspiration, infiltration, runoff, soil detachment, sediment transport, and sediment deposition to predict runoff and erosion at the hillslope scale (Robichaud et al 2006). WEPP is used to provide relative erosion values for comparison of harvest and prescribed fire effects by alternative and for predicting management activity compliance with R1 SQS for soil loss. Detailed information regarding the model inputs and analysis results can be found in the Hydrology Specialist Report.

Proposed treatment units with the same proposed activities (harvest and burning) were grouped together to determine detrimental soil disturbance because logging system design and resulting effects to the soil are the same for the same prescriptions. Detrimental disturbance resulting from temporary road construction was included when determining the anticipated DSD for the unit. This is consistent with the direction given by the Region 1 Approach to Soils Analysis Regarding Detrimental Soil Disturbance in

Forested Areas, A Technical Guide – April 2011 (USDA FS 2011). The calculation of the percent of additional DSD from a given activity is an estimate since DSD is a combination of such factors as existing groundcover, soil texture, timing of operations, equipment used, skill of the equipment operator, the amount of wood to be removed, and sale administration. The DSD estimates of proposed activities used in this project are mostly based on local monitoring and research results as described in the previous section on assumptions. The DSD estimates of proposed activities also assume that Best Management Practices (BMPs) would be implemented and that soil recovery occurs over time.

Scientific Uncertainty and Controversy

Site and soil productivity relies on complex chemical, physical, and climatic factors that interact within a biological framework. For any given site and soil, a change in a key soil variable (i.e. bulk density, soil loss, nutrient availability, etc.) can lead to changes in potential soil productivity. Defining the threshold at which productivity is detrimentally disturbed has been controversial. Powers (1990) notes the rationale for the 15 percent limit of change in soil bulk density was largely based on the collective judgment of soil researchers, academics, and field practitioners, and the accepted inability to detect changes in productivity less than 15 percent using current monitoring methods. Powers cites that the soil quality guidelines are set to detect a decline in potential productivity of at least 15 percent. This does not mean that the Forest Service tolerates productivity declines up to 15 percent, but that it recognizes problems with detection limits.

Currently soil quality standards are being studied by a cooperative research project called the North American Long-Term Soil Productivity Study (LTSP). The five and ten year results were recently published along with five key findings on 2010 (Page-Dumroese 2010, Page-Dumroese et al. 2006, Fleming et al. 2006, Sanchez et al. 2006). The LTSP study is ongoing and provides the best available science to resource professionals.

Soil Resource, Affected Environment

Introduction

In an effort to achieve legal mandates to sustain site productivity, the USFS has developed management policy to guide design and implementation of vegetation management practices (i.e., timber harvest, grazing, and prescribed burning) in ways that maintain or improve soil quality. Specifically, this management policy (known as the R1 SQS found in Forest Service Manual (FSM) 2500—Watershed and air management, USDA FS 2014a), states that new vegetation management activities should not result in detrimental soil conditions on more than 15 percent of an activity area. When operations are planned in areas that do not meet soil quality standards resulting from prior activities, new vegetation management activities should be planned to meet current standards and designed to ameliorate past detrimental soil conditions, where feasible. For this project, R1 SQS serves as the measurement indicator for determining compliance with legal mandates to sustain site productivity with implementation of management activities.

Intensively developed sites such as mines, recreation sites, administrative sites, and permanent roads and trails are areas dedicated for management uses other than vegetation

production. Therefore, soil quality standards are not applied to these areas (USDA FS 2014a). Permanent roads do affect soil hydrologic function; however, road evaluation is more appropriately conducted on a watershed basis. This analysis focuses on detrimental soil disturbance resulting from USFS vegetation management activities within proposed vegetation treatment units.

Analysis Area

Soil quality standards are to be applied to “activity areas” (USDA FS 2014a). The activity area is considered an appropriate geographic unit for assessing soil environmental effects, because soil productivity is a site-specific attribute of the land. Thus, the activity area is used as the geographic unit to assess soil environmental effects for all action alternatives.

Activity areas are defined as “a land area affected by a management activity,” such as “harvest units within timber sale areas, prescribed burn areas, grazing areas, or pastures within allotments.” For the Tenmile - South Helena Project, the geographic boundary for the activity area is represented by the boundaries for proposed vegetation treatment units, locations where temporary roads as well as log landings would be constructed, and areas where existing non-system roads would be reclaimed. The type and extent of activity areas, including harvest units, temporary roads, log landings, and areas of road reclamation, are described for each action alternative in Chapter 2.

The appropriate geographic area for soil cumulative effects analysis has been defined as the “land area affected by a management activity” (USDA FS 2014a). This is because soil productivity is a site-specific attribute of the land. Forest Service Manual 2550.5 defines soil productivity as the inherent capacity of the soil resource to support appropriate site-specific biological resource management objectives, which includes the growth of specified plants, plant communities, or a sequence of plant communities to support multiple land uses. The productivity of one area of soil is not dependent on the productivity of an adjacent area of land. Similarly, if one acre of land receives soil impacts resulting from management activities and a second management activity that may affect soil is planned for that same site, then soil cumulative effects are possible on that site. Thus, cumulative effects to soil productivity are appropriately evaluated on a site-specific basis.

The temporal scope for assessment of soil resource environmental effects includes both short- and long-term impacts. For the purposes of this analysis, short-term effects are defined as those that occur approximately within 1 to 50 years following proposed management actions. Long-term effects are defined as those that occur approximately within 50 years or more, following proposed management actions.

Affected Environment

USFS

Landtypes have been characterized for the Tenmile - South Helena project area in Soil Survey of Helena National Forest Area, Montana (USDA FS and NRCS 2001). There are 49 landtypes mapped within the project area. A summary of sensitive soil characteristics

for these landtypes is displayed in Table 169. A summary of landtype characteristics for the 49 landtypes in the project area can be found in Appendix A to the Soils Report.

Table 169. Summary of sensitive soil characteristics for the Tenmile-South Helena Project Area

<i>Sensitive Soil Characteristics</i>	<i>Acres</i>
Granitic Map Units: Highly erodible soils	25,045
Loess w/ Volcanic Ash Map Units: Vulnerable to compaction & Highly erodible soils	7,089
Loess w/ Volcanic Ash Map Units: Vulnerable to compaction & Highly erodible soils, Granitic Map Units: Highly erodible soils	3,453
Wet Soil Map Units, Granitic Map Units: Highly erodible soils	2,738
Wet Soil Map Units, Loess w/ Volcanic Ash Map Units: Vulnerable to compaction & Highly erodible soils, Granitic Map Units: Highly erodible soils	2,704
Colluvial Map Units: Slump-prone and wet soils, Wet Soil Map Units	1,651
Wet Soil Map Units	1,429
Wet Soil Map Units, Flood Plains & Terrace Map Units: Flood-prone areas and wet soils	612
Wet Soil Map Units, Loess w/ Volcanic Ash Map Units: Vulnerable to compaction & Highly erodible soils	248
Landslide Map Units: Landslide-prone and wet soils, Wet Soil Map Units	177
Alluvial Fan Map Units: Flood-prone areas	14

Parent materials and derived soil properties found across the south eastern portion of the Boulder Mountains are principally underlain by volcanic and granitic rock. There are minor surface deposits of loess that have been influenced by volcanic ash across this portion of the Helena National Forest. The western part of the project area is dominated by features from extensive glaciation including steep rock cliffs in the upper basins, straight or concave slopes in the mid basins all mantled by glacial moraines and till. Tenmile Creek and its tributaries drain the eastern portion of these mountains directly into the Missouri River and serve as a primary source of water for Helena and surrounding areas.

Soils in the project area consist of three dominant soil orders, Inceptisols, Alfisols, and Mollisols. Inceptisols are the dominant order on the landscape with 26,027 acres. Inceptisols are soils with moderate soil development. Inceptisols occur in a variety of climatic conditions. They tend to occur on steep slopes where erosion is continuously removing topsoil or convex toeslopes where colluvium is being deposited. Time tends to be the limiting factor of soil development in these soils. Alfisols are the second most mapped soil in the project area with 22,309 acres. Alfisols are soils that have clay-enriched subsoils and high base saturation. These soils typically form in forested ecosystems and tend to have high soil fertility. Mollisols are the third most mapped soils in the project area with 10,229 acres. Mollisols are typically grassland soils with thick dark surface horizons. These dark surface horizons are the result of long-term additions of organic matter primarily through grass roots.

Field Evaluation of Existing Soil Conditions

Soils within the Tenmile - South Helena Project area have been affected by past and ongoing management activities. Field evaluation was conducted in the project area during 2013 and 2014 by Helena National Forest Soil Science personnel. The purpose of this

field evaluation was to validate existing soil conditions in areas affected by past and ongoing management actions. These management activities include the following actions; past timber harvest, grazing within allotments, existing roads and trails, and off-highway vehicle use.

Past Silvicultural and Fuels Treatments

The FACTS database contains several records for past timber harvest activities in the Tenmile - South Helena Project Area. Harvest activities spanned several decades, primarily regeneration harvests in the 1960's and 1970's, which removed most of the overstory and resulted in a mosaic of regenerating patches. Precommercial thinning was the dominate activity in the 1980's and 1990's. Fuels reduction treatments occurred in units during the 2000's. Sanitation cuts began in 2010 to remove the roadside hazard trees that were a result of the mountain pine bark beetle epidemic. Documentation of all past harvest units within the project area can be found in the project record.

This field evaluation was conducted using the Forest Soil Disturbance Monitoring Protocol (Page-Dumroese et al. 2009) for assessing the degree of soil disturbance resulting from management activities. Soil science personnel traversed selected past harvest units in a randomly oriented grid pattern with sample points at regularly spaced intervals across the entire unit. Units with up to 25 acres received a point spacing of 66 feet, resulting in approximately 10 points per acre. Units 25.01 acres to 150 acres received 132 foot spacing resulting in approximately 2.5 points per acre. Units greater than 150 acres received a sample point spacing of 198 feet resulting in approximately 0.63 points per acre. At each sample point, field personnel evaluated soil physical evidence indicating soil compaction, displacement, rutting, severe burning, surface erosion, mass wasting and ground cover (e.g. plants, plant litter or duff, woody material, bare ground, etc.). Based on the observations of soil physical evidence, a numerical rating from Forest Soil Disturbance Monitoring Protocol (Page-Dumroese et al. 2009) classification was assigned to characterize degree of soil disturbance at each sample point: class 0 representing undisturbed; class 1 representing slight to low disturbance; classes 2 and 3 representing detrimental soil disturbance according to the definitions of detrimental soil disturbance described in the Region 1 soil quality standards (USDA FS 2014a).

The field evaluation found that the amount of area affected by detrimental soil disturbance within each unit varied from 19 percent in a proposed unit with past mining impacts to 0 percent in a clear-cut harvest unit. The amount of area affected by detrimental soil disturbance within sanitation harvest units was consistently 0 percent. A summary of results from this field evaluation is displayed in Table 170.

Table 170. Summary of soil characteristics

Proposed Units	Total Acres	Previous Harvest Method*	Other associated disturbance	Year of Activity	Percent DSD	Surface Texture	Total CWD
1	55	--	--	--	0	Sandy Loam	0.8
2	27	--	Wildfire	1905	0	Sandy Clay Loam	5.8
3	87	--	Wildfire	1905	0	Sandy Loam	18.3

Proposed Units	Total Acres	Previous Harvest Method*	Other associated disturbance	Year of Activity	Percent DSD	Surface Texture	Total CWD
4	25	--	--	--	0	Sandy Clay Loam	10.7
5	46	--	--	--	0	Clay Loam	9.3
6	15	--	--	--	3	Sandy Loam	7.7
11	116	RHR (Sanitation Cut)	Pile Burning	2010	0	Sandy Clay Loam	3.6
12	408	--	--	--	0	Loam	40.1
14	40	--	--	--	0	Sandy Clay Loam	1.8
15	70	--	--	--	0	Loamy Sand	5.9
16	18	--	--	--	0	Loamy Sand	2.9
17	60	RHR (Sanitation Cut)	Pile Burning	2011	0	Sandy Clay Loam	4
19	160	--	--	--	0	Loamy Sand	25.5
20	85	RHR (Sanitation Cut)	Pile Burning	2010, 2011	0	Sandy Clay Loam	8
21	99	RHR (Sanitation Cut)	Pile Burning, Wildfire	2010, 2011, 1905	0	Sandy Loam	2.2
22	163	--	Wildfire	1990	0	Loamy Sand	7.1
23	92	RHR (Sanitation Cut)	Pile Burning	2010, 2011	0	Silt Loam	8.7
24	123	RHR (Sanitation Cut)	Pile Burning, Wildfire	2010, 2011, 1990	0	Loamy Sand	6.8
25	118	--	--	--	0	Sandy Loam	17.5
26	160	--	--	--	0	--	--
27	42	--	--	--	3	Loamy Sand	3.5
28	228	RHR (Sanitation Cut)	Pile Burning	2010, 2011	0	--	--
29	152	--	--	--	0	Loam	17.1
30	92	--	--	--	0	Sandy Clay Loam	87.4
31	14	--	--	--	0	Sandy Clay Loam	14.3
32	48	RHR (Small portion)	--	--	0	Sandy Loam	31.6
33	38	RHR (Sanitation Cut)	--	--	0	Sandy Loam	6.2
34	48	RHR (Sanitation Cut)	--	--	0	Clay Loam	3.8

Proposed Units	Total Acres	Previous Harvest Method*	Other associated disturbance	Year of Activity	Percent DSD	Surface Texture	Total CWD
35	19	--	--	--	0	Sandy Loam	11.3
40	19	Stand Clearcut	Dozer Piling of Fuels	1973	3	Loam	1
41	37	Stand Clearcut, Precommercial Thinning	Broadcast Burning	1972, 1998, 1974	0	Loam	7.5
42	84	--	--	--	0	Sandy Loam	58.7
43	136	Stand Clearcut	Broadcast Burning	1970, 1971	0	Sandy Loam	6.5
44	53	--	--	--	0	Sandy Loam	5.4
45	28	--	--	--	0	Silt Loam	24.4
46	12	--	--	--	0	Sandy Clay Loam	3.2
47	85	--	--	--	0	--	--
48	38	Clearcut, broadcast burning	Tree Planting	1970, 1972	3	Sandy Loam	8.1
49	112	--	--	--	3	Sandy Loam	5.6
50	93	--	--	--	0	Sandy Loam	7.7
51	100	--	--	--	5	Sandy Loam	11.7
53	155	Slashing	Pile Burning, Wildfire	2005, 1940	0	Sandy Loam	4.2
54	41	--	Wildfire	1940	0	Loam	0.6
55	29	--	Wildfire	1919	0	Sandy Loam	2.1
56	141	--	Wildfire	1919, 1940	0	Sandy Loam	1.9
57	90	--	Wildfire	1940	0	Loam	0
58	50	--	--	--	3	Sandy Loam	5.1
60	154	Slashing	Pile Burning, Wildfire	2010, 2006, 1988	0	Loam	2.3
63	155	Slashing	Handpiling, Broadcast Burning	2010	0	Silty Clay Loam	12.7
64	118	Slashing	Broadcast burning	2010, 1988	0	Loam	10.9
66	50	Broadcast Burning, Pile Burning	Slashing	2009, 2014	0	Silty Clay Loam	7.3
68	104	--	--	--	0	Silty Clay Loam	2.7
69	13	--	--	--	19	Sandy Loam	5.5
70	67	--	--	--	0	Sandy Loam	4.4
71	42	--	--	--	3	Sandy Loam	9
72	86	--	Wildfire	1919	0	Sandy Loam	2.6

Proposed Units	Total Acres	Previous Harvest Method*	Other associated disturbance	Year of Activity	Percent DSD	Surface Texture	Total CWD
73A	83	Clearcut	Tree Planting, Broadcast Burning	1971, 1972, 1982, 1985, 1987	3	Sandy Loam	7.2
74	27	Clearcut, Broadcast burning	Tree Planting	1970, 1972	0	Sandy Loam	2.2
75	72	--	--	--	0	Loamy Sand	9.8
76	104	--	--	--	0	Sandy Loam	19.1
77	95	--	--	--	0	Sandy Loam	0.5
78	183	--	--	--	0	Loamy Sand	19.6
80	56	--	--	--	0	Sandy Loam	0
81	57	--	--	--	0	Sandy Clay Loam	4.6
82	95	--	--	--	0	Loamy Sand	14.2
83	20	--	--	--	0	--	--
84	162	--	--	--	0	Loam	26.9
86	119	Slashing	Broadcast Burning, Pile Burning	2010, 2011, 2006	0	Silty Clay Loam	2.5
87	90	Slashing, Broadcast Burning	--	2010, 2014	0	Silt Loam	0.5
88	81	Slashing, Pile Burning, broadcast Burning	--	2004, 2005, 2008	0	Loam	0.6
91	126	Slashing	--	2010	0	Silt Loam	5
92	106	--	Wildfire	1943	3	Loam	3.5
98	307	--	--	--	0	--	--
100	87	--	--	--	0	Sandy Loam	8.3
101	159	Clearcut, Sanitation Cut	Pile Burning	2010	3	Sandy Loam	7.7
103	92	--	--	--	0	Loam	3.6
104	114	--	--	--	0	Sandy Loam	10.9
105	44	Commercial Thinning	Pile Burning	2009, 2011	4	Loamy Sand	19.9
107	146	Clearcut, Precommercial Thinning	Chipping of Fuels	1968, 1993, 1968	0	Sandy Loam	4.2
108	20	--	--	--	0	Sandy Clay Loam	5
109	62	--	--	--	0	Loamy Sand	5.1
110	111	--	--	--	3	Loam	13.6
111	24	--	--	--	0	Loamy Sand	3.3

Proposed Units	Total Acres	Previous Harvest Method*	Other associated disturbance	Year of Activity	Percent DSD	Surface Texture	Total CWD
112	17	Broadcast Burning, Slashing	--	2010	0	Clay Loam	2.2
113	32	--	--	--	0	Silt Loam	13.7
114	40	--	--	--	0	Sandy Loam	12.8
117	64	--	--	--	0	Sandy Loam	4
118	179	--	--	--	0	--	--
119	19	--	--	--	0	Sandy Loam	16.7
121	20	Clearcut, Broadcast Burning	Tree Planting	1970, 1972	0	Loamy Sand	15.2
124	22	--	Wildfire	1919	3	Loam	13.2
129	1050	--	--	--	0	Sandy Loam	10.2
130	28	--	Wildfire	1919	0	Loam	15.8
138	35	Clearcut	Broadcast Burning	1971, 1972	3	Sandy Loam	9.2

Grazing Allotments

Cattle grazing is currently permitted in the MacDonald Pass G&H Grazing Allotment, Big Buffalo C&H Grazing Allotment, Little Buffalo C&H Grazing Allotment, and the Frohner C&H Grazing Allotment which are located in part within the Tenmile - South Helena Project area. The majority of the Tenmile - South Helena Project area does not overlap a grazing allotment and soil monitoring efforts did not report any detrimental disturbance from cattle as livestock typically do not graze in forested areas.

Mining

There is a history of past and current mining in the project area. There are numerous mineral features in the project area that are from historic mining operations. Very little new mining has occurred since the 1960s. Recent efforts by miners are on a small scale and localized, usually conducted by one or two individuals, over a short field season and typically less than one acre of disturbance. Active mine sites with a plan of operations are considered to not contribute to detrimental soil disturbance. For more information on current or past mining see the Minerals Specialist Report. The impacts of past mining contribute to detrimental soil disturbance and were noted during the soil monitoring efforts for several units. Several units without past vegetation treatment were noted to have mining impacts varying from 0% detrimental soil disturbance to 19 percent.

Existing Roads / Trails & Off-highway Vehicle Use

Currently, there are approximately 204 miles of roads and 10 miles of trails within the Tenmile - South Helena Project area. Under existing conditions, these roads affect approximately 612 acres of land, while trails affect about 15 acres. Soils affected by existing roads and trails are being managed for transportation and access uses, and are not currently being managed for vegetation production, or productivity. This rule does not apply to non-system roads.

During the field work, crews noted several non-system roads within the project area and within the treatment units. Those non-system roads are accounted for in the existing detrimental soil disturbance for those units. Those roads ranged from obsolete logging roads that do not receive use to well-used unauthorized ATV trails. Documentation of those non-system roads is contained in the Soil Specialist project record.

BLM

Landtypes have been characterized for the Tennile - South Helena project area in Soil Survey Lewis and Clark County, Montana (USDA NRCS 2003). There are 13 landtypes mapped within the project area. A summary of these landtypes is displayed in Table 171. The BLM portion of the project area is dominated by soils developed from limestone, argillite, and granites. The landtypes by unit can be found in Appendix A to the Soils Report.

Table 171. Landtype characteristics for the BLM project area

Landtype	Acres	Soil Type	Parent Material	Surface Texture
286E	443	Woodgulch-Elbeth-Rock outcrop complex, 8 to 35 percent slopes	colluvium derived from granite	Slightly decomposed plant material
885F	132	Whitecow-Warneke channery loams, 15 to 45 percent slopes	gravelly colluvium derived from limestone	Slightly decomposed plant material
664E	108	Windham-Whitecow-Lap channery loams, 15 to 45 percent slopes	gravelly colluvium derived from limestone	Channery loam
61E	99	Holter-Castner channery loams, 8 to 45 percent slopes	gravelly colluvium derived from argillaceous limestone	Channery loam
386E	70	Peeler stony sandy loam, 15 to 45 percent slopes	fine-loamy slope alluvium derived from granite over sandy and gravelly residuum derived from granite	Slightly decomposed plant material
164E	50	Windham-Lap channery loams, 8 to 45 percent slopes	gravelly colluvium derived from limestone	Channery loam
63F	36	Mocmont-Tolex complex, 25 to 60 percent slopes	colluvium derived from argillite	Slightly decomposed plant material
84F	34	Mocmont-Tolex complex, cool, 25 to 60 percent slopes	colluvium derived from argillite	Slightly decomposed plant material
85F	22	Whitecow channery loam, 35 to 60 percent slopes	gravelly colluvium derived from limestone	Slightly decomposed plant material
301B	14	Typic Ustifluvents, 0 to 4 percent slopes	Varied	Varied
685F	10	Whitecow channery loam, cool, 25 to 60 percent slopes	gravelly colluvium derived from limestone	Slightly decomposed plant material
486F	2	Peeler-Rock outcrop complex, 15 to 60 percent slopes	fine-loamy slope alluvium derived from granite over sandy and gravelly residuum derived from granite	Slightly decomposed plant material
761C	1	Baxendale-Castner complex, 4 to 15 percent slopes	alluvium and/or colluvium	Sandy loam

Table 172. Landtype hazards for the BLM project area.

Landtype	Acres	Surface Erosion Hazard	Subsurface Erosion Hazard	Compaction Resistance	Rutting Hazard
286E	443	Moderate	Severe	Moderate	Moderate
885F	132	Moderate	Severe	Moderate	Severe
664E	108	Moderate	Severe	Low	Slight
61E	99	Moderate	Severe	Low	Severe
386E	70	Moderate	Severe	Moderate	Severe
164E	50	Moderate	Severe	Low	Slight
63F	36	Severe	Severe	Moderate	Slight
84F	34	Severe	Severe	Moderate	Slight
85F	22	Severe	Severe	Moderate	Severe
301B	14	---	----	---	---
685F	10	Severe	Severe	Moderate	Severe
486F	2	Severe	Severe	Moderate	Severe
761C	1	Slight	Moderate	Low	Moderate

The subsurface erosion hazard interpretation indicates the hazard of soil loss from unsurfaced roads and trails. The hazard is described as "slight," "moderate," or "severe." A rating of "slight" indicates that little or no erosion is likely; "moderate" indicates that some erosion is likely, that the roads or trails may require occasional maintenance, and that simple erosion-control measures are needed; and "severe" indicates that significant erosion is expected, that the roads or trails require frequent maintenance, and that costly erosion-control measures are needed.

The surface erosion hazard rating indicates the hazard of soil loss from off-road and off-trail areas after disturbance activities that expose the soil surface. The hazard is described as "slight," "moderate," "severe," or "very severe." A rating of "slight" indicates that erosion is unlikely under ordinary climatic conditions; "moderate" indicates that some erosion is likely and that erosion-control measures may be needed; "severe" indicates that erosion is very likely and that erosion-control measures, including revegetation of bare areas, are advised; and "very severe" indicates that significant erosion is expected, loss of soil productivity and off-site damage are likely, and erosion-control measures are costly and generally impractical.

Compaction resistance indicates whether the soil contains features that are resistant resilient to compaction. Compaction tends to reduce water infiltration which affects plant production and composition, increases runoff which generally increased erosion rates, and affects organisms living within the soil. "High resistance" indicates that the soil has features that are very favorable to resisting compaction. "Moderate resistance" indicates that the soil has features that are favorable to resisting compaction. "Low resistance" indicates that the soil has one or more features that favor the formation of a compacted layer.

The rutting hazard interpretation indicates the vulnerability of surface rut formation through the operation of forestland equipment. Soil displacement and puddling (soil deformation and compaction) may occur simultaneously with rutting. Ratings are based

on depth to a water table, rock fragments on or below the surface, the Unified classification of the soil, depth to a restrictive layer, and slope. The hazard is described as slight, moderate, or severe. A rating of "slight" indicates that the soil is subject to little or no rutting. "Moderate" indicates that rutting is likely. "Severe" indicates that ruts form readily.

Soil erosion and compaction properties and interpretations from the soil survey are used to analyze the soil impacts from activities on BLM ground (Table 172). Erosion can cause decreased soil productivity, and can negatively impact water quality when eroded soil reaches streams or wetlands. Compacted soils can reduce site productivity, and reduce the soil's capacity for infiltration of surface water and hydraulic conductivity (Siegel-Issam et al. 2005). The subsurface erosion hazard for the project area is 98.6 percent severe, surface erosion hazard is 10.2 percent severe, compaction resistance is 25.3 percent low resistance, and rutting hazard is 32.8 percent severe (USDA, 2003).

Surface horizons for most soils in the project area have high levels of organic matter content ranging from 3 percent to 50 percent, placing them at risk of becoming hydrophobic in the event of wildfire. Hydrophobic soils repel water, thereby increasing risk of runoff and erosion, particularly the first year following fire (Neary et al. 2005, MacDonald & Huffman 2004, Robichaud 2000, Wondzell and King 2003).

High severity wildland fire can consume organic matter on the soil surface, which negatively impacts nutrient cycling, killing soil microorganisms and releasing carbon dioxide into the air. This negatively impacts soil productivity (Smith et al. 2005, Smith 2000, Stoof et al. 2011a). Soil organic matter acts as a soil stabilizing factor and nutrient source. High severity wildland fire can negatively impact soil productivity due to high losses of carbon and nitrogen from combustion of surface soil organic matter (Homann et al. 2011).

Soil Resource, Environmental Consequences

Introduction

Soil quality standards are to be applied to "activity areas" (USDA FS 2014a). The activity area is considered an appropriate geographic unit for assessing soil environmental effects, because soil productivity is a site-specific attribute of the land. Thus, the activity area is used as the geographic unit to assess soil environmental effects for all action alternatives.

All temporary roads, proposed units, skid trails and landings are considered to be part of an activity area. Specified transportation facilities, areas administered by special use permit and dedicated trails are excluded. These soil guidelines are to be applied for design and evaluation of vegetation management activities.

Effects Common to All Alternatives

There are no quantifiable effects common to all alternatives because soil impacts vary from no action (alternative 1), to changing prescriptions under the action alternative within each activity area.

Effects Common to All Action Alternatives

For all action alternatives, the same types of management activities are proposed (except as otherwise noted in the following analysis), with the differences among alternatives primarily reflected in the extent and location of affected areas. Similarly and within this context, the type and magnitude of soil effects associated with each action alternative would generally be the same, with the differences among alternatives reflected in the extent and location of affected areas. For this reason, the type and magnitude of soil effects predicted as a result of proposed management actions is described in this section (i.e. “Soil Resource Effects Common to All Action Alternatives”) of the soil resource report. The extent and location of areas affected by proposed management actions are described in the Effects by Alternative table specific for each alternative. Only the units with specific design features to ensure those units stay within Region 1 Soil Quality Standards are discussed further under each alternative. Incorporating the design criteria would ensure all units would be in compliance with Region 1 Soil Quality Standards.

Direct/Indirect Effects

Construction of Temporary Roads

Soil effects resulting from construction and use of temporary roads include removal of vegetation, compaction, degradation of soil structure, decreased infiltration and water holding capacity, reduction in organic material, accelerated surface erosion, and increased likelihood of mass failure, such as landslides or slumps. In short, road construction and use results in impacts to soil productivity. Soil erosion is of special concern because eroded material can be transported to streams, and thus impair water quality or aquatic habitat, in nearby streams (see Hydrology Specialist report). Erosion tends to be least on roads with flat grades, and most severe on routes that have steeper gradients. Sediment delivery tends to be most problematic on roads located adjacent to or crossing streams.

In the short-term soils affected by temporary road construction and obliteration would be detrimentally disturbed (i.e. compacted, displaced, rutted, eroded, etc.) during logging operations. For the purposes of this analysis, soil impacts associated with temporary road construction are included when determining compliance with Region 1 soil quality guidelines for detrimental disturbance in tractor and cable harvest units, because temporary roads would be part of the activity area for those treatment units. This obliteration would be accomplished by recontouring areas of cut and fill construction, subsoiling (i.e. ripping) compacted soils, and seeding areas of soil disturbance. Obliteration of temporary roads through soil scarification (ripping), seeding, placement of woody debris and recontouring would promote recovery of soils in the long-term. Thus, new temporary road construction would have short-term impact to soils, but obliteration would facilitate recovery of soil productivity over the long-term. Recovery of soils to pre-disturbance conditions would likely take 50 years or longer.

Ground Based (Tractor) Harvest: Main Skid Trails and Log Landings

Scientific studies have documented that log retrieval systems differ substantially in their immediate effect on soils, with tractor skidding over bare ground causing the greatest degree of soil disturbance within harvest units. Winter tractor logging and suspended log

yarding methods (i.e. cable yarding) have less impact to soils compared to tractor skidding over bare ground (USDA FS 2013).

Under all action alternatives, detrimental soil disturbance would occur with operation of ground-based heavy equipment for tree thinning and removal, primarily in areas where logging equipment traffic is concentrated, such as main skid trails, log landings, and temporary roads. Soil impacts resulting from temporary roads have been evaluated in a previous section of this report. Detrimental soil disturbance on primary skid trails and log landings are discussed in the following paragraphs.

Detrimental soil disturbance, in this instance, would be a short-term impact because of a long-term trend for soil recovery through reclamation measures and/or natural recovery processes (i.e. frost heave bio-perturbation, biomass input and nutrient cycling, etc.). Soils may take at least 50 years for recovery to pre-disturbance conditions where reclamation measures (scarification and seeding) would be implemented, such as on temporary, skid trails and log landings. Soils would take longer to recover to pre-disturbance conditions, perhaps at least 100 years, where only natural recovery processes would occur.

In the short-term, soils at log landing sites would be detrimentally disturbed (i.e. compacted, displaced, rutted, eroded, etc.) during operation of heavy equipment for log processing. Upon completion of harvest activities, reclamation of log landings through soil scarification, seeding, placement of woody debris and recontouring (if needed), would promote recovery of soils in the long-term. Recovery of soils to pre-disturbance conditions would likely take 50 years or longer.

Cable Yarding Tree Removal: Log Yarding Corridors and Log Landings

Under all action alternatives, detrimental soil disturbance would occur within cable yarding corridors, where the “butt-end” of logs contact the soil while being pulled up hill. In the short-term, soil would be detrimentally disturbed by compaction, displacement, rutting and erosion in the areas affected by cable yarding. Over the long-term, soils affected by detrimental disturbance in cable yarding corridors would recover through natural processes, such as frost heaving, bio-perturbation and nutrient cycling. However, recovery of soils to pre-disturbance conditions would likely take 100 years or longer.

With cable yarding systems, log landings would generally be located on the shoulder of the road used to access the harvest unit. Because the cable yarding equipment would be set-up and operating on the access road prism, there would not be soil impacts from heavy equipment on the log landing sites. Therefore, detrimental soil impacts would be negligible in the log landing sites for cable yarding units.

Tree Thinning Using Hand Treatment Methods

Under all action alternatives, vegetation management prescriptions for hand treatment methods to thin small diameter trees would be accomplished by persons using chainsaws or other hand tools. Access into the hand treatment units would be via walking and hand-carrying tools to the site.

Prescribed Fire: Soil Erosion and Severe Burning

Proposed fire prescriptions for vegetation treatments under all action alternatives have been grouped based on severity and subsequently assigned soil disturbance estimates based on bare soil amounts in the burn description. Most prescribed burning would have a mix of low, moderate, and severe burn effects.

With low severity burning, soil heating would be low, with soil temperatures remaining below 50 degrees Celsius at a depth of 1 centimeter. The mineral soil would not be altered with low severity burning. Typically, less than 2 percent of the area affected by a low severity fire would be severely burned (DeBano et al. 1998). Low burn severity includes: underburn and low severity broadcast burns. Low severity burning in forested ecosystems would result in the surface litter being charred or consumed, but the duff would be left intact. In shrubland/grassland ecosystems, plant leaves or stems may be consumed by low severity fire; however, grass root crowns would typically remain viable so that grasses would be able to re-sprout after the fire. Following low severity burning, sufficient soil cover would be present to prevent detrimental soil erosion: duff would remain in forested ecosystems, while grasses would re-sprout in shrubland/grassland ecosystems.

With mixed or moderate severity burning, soil heating would be moderate, with soil temperatures reaching 100 to 200 degrees Celsius at a soil depth of 1 centimeter. Typically, less than 10 percent of the area affected by a moderate severity fire would be severely burned (DeBano et al. 1998). Moderate severity burning could consume up to 80 percent of the litter and duff layers and fine roots may be scorched but not consumed. However, the mineral soil would not be altered. Mixed burn severity includes: site prep burning and broadcast burning.

Severe soil burning would constitute detrimental soil disturbance within the prescribed fire treatment units. The amount of high burn severity in the treatments is limited by design measures and the burn prescription. High burn severity typically results in all pre-fire ground cover and surface layers being consumed and charring on larger roots. The color of the soil is often gray or orange at these sites and the structural stability of the soil has been altered. These soils may be hydrophobic and at risk of higher erosion rates.

Burning slash piles would severely burn and impact soils in the localized areas coinciding with placement of the piles, because slash concentrated into a pile tends to generate very high heat output during burning. Based on a field review of post-treatment conditions in Clancy-Unionville Vegetation Project fuels reduction units where the same type of management activities have recently been implemented, piling and burning would affect less than 5% of areas treated (USDA FS 2005). High burn severity includes pile burning and jackpot burning.

For jackpot burning, it is predicted that soil effects would be comparable to those predicted for slash piling and burning because discrete areas of fuel accumulation are targeted for ignition and burning. Specifically, severe burning would occur in the locations where fuel accumulations burned.

For this analysis, soil erosion modeling was completed for proposed treatments using Water Erosion Prediction Project software (WEPP). Results of the erosion modeling is

summarized for the Hydrology report, while the complete set of input data and output results for the WEPP modeling can be found in the project record. It is predicted that erosion rates would be less than 1-2 tons per acre per year. This is based on field review of post-treatment conditions in Clancy-Unionville Vegetation Project fuels reduction units where similar types of management activities have recently been implemented (USDA FS 2005).

Tree Removal and Prescribed Fire: Biomass and Nutrient Cycling

Removal of biomass through timber harvest and prescribed burning can potentially leave insufficient organic material for future nutrient cycling. Researchers have recommended optimum amounts of coarse woody material to remain following vegetation management activities to sustain nutrient cycling and maintain long-term site productivity (Brown et al. 2003, Graham et al. 1994).

For all action alternatives, the Tennile - South Helena Project has been designed to retain a minimum of 5 tons per acre of coarse woody material on the ground for warm, dry habitat types, and a minimum of 10 tons per acre of coarse woody material on the ground for all other habitat types. This design feature would be applied to all treatment prescriptions and treatment units, under all action alternatives. These amounts of coarse woody material are consistent with the amounts recommended by researchers to be retained and thus sustain nutrient cycling following management activities (Graham et al. 1994, Brown et al. 2003).

Additional woody biomass would be retained on many sites as snags, which would provide for future recruitment of coarse woody material on the ground as snags decay and fall. Graham and others (1994) note, “these recommendations are not designed to immediately replace the present forest floor and mineral soil organic matter, but to ensure their replacement over the next 100 years or more.” Thus, retention of recommended amounts of coarse woody material would ensure sufficient biomass “is left after harvesting for the development and function of the next forest” (Graham et al. 1994).

Because this same design feature would be applied to all treatment prescriptions and treatment units under all action alternatives, recommendations for retaining minimum amounts of coarse woody material are only discussed in this section of the soil resource report and not discussed again under each action alternative.

Tree Removal and Prescribed Fire: Mollisols

The Mollisols found in the project area primarily occur in the South Helena landscape or the eastern half of the project area. This area is principally characterized by dry Douglas-fir and ponderosa pine forests intermixed with grasslands. These drier vegetation types historically would have burned with relatively high frequency. The lack of natural fire in this landscape has resulted in a buildup of surface fuels, ladder fuels (small trees) and conversion of seral types such as ponderosa pine to more shade tolerant species such as Douglas-fir (for more information, see the Vegetation Specialist Report and Fuels Report). The thinning and prescribed fire treatments proposed on these soils would restore the sites to a more historic landscape setting.

Watershed Restoration Activities

Wetland restoration for 17 acres of existing wetland including a reroute of FS road 299 and approximately 15 miles of road decommissioning have been proposed for all action alternatives in the Tenmile - South Helena project. These actions would restore approximately 72 acres of land back to the productive land base. Actions would restore soil hydrologic function and carbon storage potential.

Mechanical Tree Thinning, Log Landings, Temporary Roads, and Prescribed Fire: Combined Soil Effects

Under each of the action alternatives, some of the proposed prescribed fire treatment units would be mechanically thinned prior to burning. Thus, there would be additive soil effects from prescribed burning combined with soil effects from either tractor, or cable yarding, plus log landings and temporary roads constructed to access those units. For the purposes of this analysis, these additive soil effects are evaluated for the activity areas affected by the combinations of treatment activities for each action alternative, to determine compliance with R1 SQS for limiting detrimental soil disturbance to 15 percent or less of the area.

There would be eight possible combinations of tree thinning activities and/or prescribed fire treatments. The eight combinations, analyzed separately for each of the action alternatives, are:

- Ground based harvest with broadcast and/or site prep burn.
- Ground based harvest with handpile, jackpot, or underburn.
- Ground based precommercial thin with handpile or jackpot burn.
- Ground based rearrangement of fuels with broadcast burn.
- Ground based rearrangement of fuels with handpile, jackpot, or underburn.
- Cable yarding tree removal with handpile, jackpot, underburn, broadcast and/or site prep burn.
- Hand rearrangement of fuels with handpile, jackpot, underburn, or broadcast burning.
- Hand precommercial thin with handpile or jackpot burn.

BLM Direct/Indirect Effects

There are approximately 1043 acres of activity proposed for both action alternatives on BLM lands. Sixty-seven percent of the treatments use ground based equipment, 9% are cable harvests, and all treatments include a prescribed fire activity. The severe erosion, low compaction resistance, and severe rutting hazard ratings per unit are shown in Table 173.

Table 173. BLM unit and landtype hazard ratings.

Unit	Acres	Treatment Method	Prescribed Burn Method	% of Unit with Severe Surface Erosion Hazard	% of Unit with Severe Subsurface Erosion Hazard	% of Unit With Low Compaction Resistance	% of Unit with Severe Rutting Hazard
139	84	Hand	Handpile or Jackpot	20%	100%	76%	79%
140	181	Ground Based	Jackpot or Underburn	0%	100%	1%	19%
142a	49	Ground Based	Site Prep Burn	0%	100%	2%	2%
142b	32	Hand	Handpile, Jackpot, or Broadcast	24%	100%	76%	76%
143a	184	Ground Based	Site Prep Burn	0%	100%	0%	0%
143b	58	Cable	Jackpot or Underburn	0%	99%	1%	0%
146	134	Hand	Handpile or Jackpot	0%	98%	37%	61%
147	27	Ground Based	Jackpot or Underburn	0%	100%	100%	0%
148	26	Ground Based	Jackpot or Underburn	0%	100%	79%	21%
163	13	Cable	Jackpot or Underburn	0%	93%	47%	46%
164	21	Ground Based	Jackpot or Underburn	0%	90%	0%	90%
165	19	Cable	Jackpot or Underburn	0%	92%	45%	47%
166a	14	Hand	Handpile or Jackpot	0%	93%	90%	3%
166b	14	Ground Based	Jackpot or Underburn	0%	68%	2%	66%
167	22	Hand	Handpile or Jackpot	33%	93%	61%	33%
168	1	Hand	Handpile or Jackpot	0%	100%	62%	38%
169	16	Hand	Handpile or Jackpot	0%	100%	100%	0%
170	2	Hand	Handpile or Jackpot	0%	100%	100%	0%
171	40	Ground Based	Jackpot or Underburn	5%	100%	0%	99%
172	80	Cable	Jackpot or Underburn	89%	100%	11%	39%

The greatest potential for erosion due to management actions is expected in mechanical treatment areas. Hand-cutting operations would be expected to have the least impact on soils. Controlling the location and timing of mechanized treatments would decrease the

risk of erosion. Operating when soils are dry or frozen reduces the risk for compaction and erosion (Nishimura et al. 2011). Mechanical treatments are expected to expose the soil surface, such as on skid trails, which would temporarily increase the risk of erosion and displace surface organic matter (litter). Units with the highest risk of surface erosion after treatment include 172, 167, 142b, and 139. All four of these units have either hand or cable treatments proposed which would limit the risk of erosion.

Generally, compaction on roads and skid trails can slow regeneration due to the root-limiting nature of a compacted layer. This compaction can also cause a loss of pore space and structure that can lower water storage capability and aeration (Siegel-Issam, et al. 2005, Daddow and Warrington 1983). Decommissioning temporary roads using ripping and seeding would help restore infiltration and hydraulic conductivity at the surface of the soil (Schwen et al. 2011). The erosion risks for temporary roads are shown in Table 174. The tap rooting systems of the native Douglas-fir and lodgepole pine trees would work well in concert with natural weathering processes to break up less severely compacted layers away from roads and skid trails.

Table 174. BLM temporary roads and erosion hazards

Temporary Road	Map Unit	Subsurface Erosion Hazard	Surface Erosion Hazard	Miles
TPVT-4785-1a	286E	Severe	Moderate	0.06
TPVT-4785-1	286E	Severe	Moderate	1.57
TPVT-4785-1	761C	Moderate	Moderate	0.06
TPVT-4785-1b	286E	Severe	Moderate	0.75
TPVT-4785-1c	286E	Severe	Moderate	0.15
TPVT-4785-1b1	286E	Severe	Moderate	0.26
TPVT-4780-1	286E	Severe	Moderate	0.07
T696-1	761C	Moderate	Moderate	0.05
T696-1	286E	Severe	Moderate	0.19
TPVT-4812-1	84F	Severe	Severe	0.53
TPVT-4812-1	63F	Severe	Severe	0.13
TPVT-4812-1	61E	Severe	Severe	0.13

Excluding riparian forests and buffer strips from mechanized treatment, in compliance with Montana Stream Management Zones, leaves them intact to capture sediment and nutrients from entering streams (Moriassi et al. 2011; Davis et al. 2011). Excluding these typically moist soils from mechanized treatment also avoids the most compaction prone soils in the project area (Labelle et al. 2011).

The proposed treatments to remove live and dead trees to reduce the threat of high severity wildland fire, would also reduce the risk of hydrophobic soils, particularly those with high duff layers, or high levels of organic matter incorporated into the surface horizons. In response, the risk of hydrophobicity induced erosion and reduced infiltration would decrease (Madsen et al. 2011).

Soil erosion and other negative impacts to soil beneath slash and pile burns are likely, in response to the burning of protective vegetation and organic matter. For pile burns, these effects would be localized and minimal across the landscape with implementation of BMPs. Effects from broad-scale slash burns would be minimized by burning in moist conditions during the fall or spring, using a low intensity burn.

Hand-cutting treatments would be used on soils at high risk of erosion and compaction, if treatment was deemed necessary. Existing trails would be used where possible, but new trails may be created. Displacement of soil organic matter, erosion, and compaction would be minimal and mitigated due to the lack of ground disturbing activities, except for potential access trails, which would be seeded to reclaim the site. Minimizing impacts to litter levels maintains the carbon and nutrient pool, thereby having less of an impact on soil productivity than mechanized treatments.

Cumulative Effects

Since soil productivity is a site-specific attribute of the land, soil cumulative effects occur where impacts from past or reasonably foreseeable management activities overlap in space and time with effects of proposed actions. For this analysis, soil cumulative effects are addressed on a site-specific basis where effects of past or reasonably foreseeable

management activities overlap in space and time with effects of proposed vegetation treatments. Consequently, the proposed treatment units with Tenmile - South Helena Project serve as the geographic area for soil cumulative effects analysis. The past or reasonably foreseeable management activities within the project area with potential for soil cumulative effects in proposed treatment units include past timber harvest, livestock grazing, noxious weeds treatments, mining activities and off-highway vehicle use. The existing soil effects resulting from these past or ongoing uses are described in a previous section of this report, and serve as the foundation for this soil cumulative effects evaluation.

R1 SQS serves as the measurement indicator for determining compliance with legal mandates to sustain site productivity with implementation of management activities. Long-term effects are defined as those that occur approximately within 50 to 100 years, or more, following proposed vegetation treatments.

Areas within the Tenmile - South Helena Project area have undergone past silvicultural, fuels management and/or site preparation activities as discussed in Past Silvicultural and Fuels Treatments section above. The detrimental soil disturbance associated with past silvicultural activities was evaluated based on field examinations and diagnoses of the proposed units by the HLCNF Forest Silviculturist and the field soil disturbance results for selected proposed units monitored under direction of the HLCNF Forest Soil Scientist. Results of the monitoring of detrimental soil disturbance related to past silvicultural activities are displayed in Table 170.

Livestock grazing would be reasonably foreseeable in areas where tree thinning and prescribed burning would be completed. The project area contains portions of four grazing allotments. Thus, adverse soil cumulative effects of livestock grazing, mechanical thinning, and prescribed burning may be of concern. Potential cumulative effects of livestock grazing in proposed treatment units would be mitigated by deferring grazing for at least one growing season, if not two, following vegetation treatments including regeneration harvest, prescribed burning, and planting. This would minimize possible cumulative effects of grazing and vegetation treatments.

Noxious weeds tend to invade sites with soil disturbance, such as areas affected by road construction, timber harvest, and prescribed burning decreasing biological diversity. Research has shown non-native plants employ a number of strategies to establish a presence on new sites regardless of vegetation-management-related disturbance. These include wind pollination, and adaptability to high and low moisture. Some nonnative weeds are perfectly adept at invading sites in the absence of soil disturbance (Neary et al. 2002). As stated by Neary and others (2002), “The majority of research studies dealing mostly with harvesting impacts reported no change or an increase in plant diversity. Neary goes on to say; “Although the common assumption is that these diversity impacts are negative, they can be highly positive depending on the type and level of disturbance. There is potential for cumulative effects to soils from noxious weed invasion in areas heavily disturbed by proposed vegetation management activities, such as landings. The extent and likelihood of noxious weed invasions in areas affected by proposed vegetation management activities is analyzed and disclosed in the Invasive Plants Report for this project. The Invasive Plants Report also specifies several design features to minimize

effects of noxious weeds. With this, soil cumulative effects from noxious weeds would be minimized.

Past mineral activities on forest lands are common throughout the Tenmile - South Helena Project Area. Effects of those mineral activities on the soils are documented in the existing condition as detrimental soil disturbance. Future mineral proposal activities are expected in this area.

The reasonably foreseeable future action that may overlap the proposed management actions in the Tenmile - South Helena Project area is the upcoming Divide Travel Plan. The Helena National Forest is proposing changes to the existing road and motorized trail systems on National Forest System lands in the Divide Area. The purpose of this project is to designate roads, motorized trails and motorized over-snow areas in the Divide Planning Area. The upcoming Divide Travel Plan decision limits motor vehicle use to designated open roads and motorized trails. Off-road use by motorized vehicles is not authorized.

BLM Cumulative Effects

There are no known past vegetation, fuels, or mineral management actions or wildfires within the BLM portions of the project area. The project area does encompass two livestock grazing allotments (Blue Cloud and Colorado Gulch) and therefore livestock grazing would be reasonably foreseeable in areas where tree thinning and prescribed burning would be completed. Adverse soil cumulative effects of livestock grazing, mechanical thinning, and prescribed burning may be of concern. Grazing would continue to impact these management units and may hinder soil recovery after harvest.

Alternative 1

Direct/Indirect Effects

Fire was historically the predominant natural disturbance in the Tenmile – South Helena project area and lightning ignitions largely determined where and when fires started, while burning by indigenous peoples is presumed to have occurred at lower elevations within the project area (for more details see the Vegetation Specialist Report). Such fires reduced excessive ground and ladder fuels, encouraged healthy grass and other understory vegetation and the resilient ground cover they generated, and aided in recycling of soil nutrients, and promoted organic matter retention and buildup in the soil surface layers.

The vegetation conditions that exist today in Tenmile watershed (the western part of the project area) were shaped not only by fire suppression, but also climatic trends, large fires that occurred prior to settlement, and fuelwood cutting that occurred around the turn of the previous century to support the mining and railroad industries. Modern timber harvest has also caused some change, although very little harvest has occurred. Fire history maps indicate that much of the area burned in a large wildfire in approximately 1890. The climate early in the 20th century when forests were re-establishing following these disturbances was generally cool and moist, conducive to forest growth. The landscape became characterized by relatively densely stocked stands dominated by even-aged lodgepole pine, with some subalpine fir and spruce at upper elevations and drier

Douglas-fir dominated at lower elevations. With the exception of small fires that were suppressed, the homogeneity of this landscape has been largely unbroken. While stand replacement effects would have been typical, there would also have been mixed and low severity fires that left substantial remnant components.

The South Hills portion of the project area (the eastern part) is lower in elevation, and is a landscape of large grasslands and dry forests. Historically, many dry coniferous forests were shaped by frequent, low-intensity fire; this included the warm, dry as well as moist Douglas-fir habitat types of the Tennile – South Helena project area. This disturbance regime sustained open, large-tree dominated landscapes with diverse and productive understory communities. However, over the last century, fire suppression, livestock grazing, and high-grade logging, among other factors, have altered the structure and function of dry coniferous forests across much of western Montana, including the project area. Forest structure and composition has been most significantly altered with the lack of fire disturbance; the disruption of the natural fire intervals of the past have resulted in higher stand densities, multi-layered stands of mostly one species, Douglas-fir. Dramatically higher stand densities and development of ladder fuels increase the risk of uncharacteristically severe wildfire, bark beetle infestations, and in some areas such as the Tennile – South Helena project area, successional replacement by shade-tolerant competitors.

These changes including higher tree density, more multi-storied stands and ladder fuels, and a greater homogeneity of structures across the landscape result in a greater probability for disturbances to affect large contiguous areas. Forest types with naturally high fire frequencies and mixed severity regimes, primarily ponderosa pine and Douglas-fir, have been altered substantially. Fire in dry forests has shifted from low-intensity, high frequency regimes to moderate and high-severity regimes, with consequent increases in uncharacteristic large-scale stand-replacing fires. Landscapes are increasingly homogeneous in composition and structure, and the regional landscape is set up for severe, large fire and insect disturbance events. The role of fire as a stand replacement agent becomes more pronounced when the natural fire-free interval is increased through fire suppression.

Current uses would continue, and undisturbed sites would function as they are presently. The mountain pine beetle outbreak started in 2006 in the project area, with the peak in 2008 and 2009; beetle-killed trees have already started to fall over, with about 80 to 90 percent of the trees expected to be on the ground within approximately 8 years (Mitchell and Preisler, 1998). The resulting fuel accumulation would be variable, but is estimated to be between 40 and 80 tons per acre of 3 inch and larger material, with some areas exceeding 100 tons per acre of material (see Forested Vegetation Specialist Report). A more in depth discussion of standing dead timber and how it relates to fuel loading can be found in the Fire and Fuels Specialist Report. Further field validation will be conducted between the DEIS and FEIS.

As stated in the Fuels Specialist report, fuel loading in excess of 20 tons per acre of 1000-hr fuels leads to longer fire residence times. Residence time refers to the total length of time that the flaming front of the fire occupies one point. Large quantities of dead and down material typically burn slowly with high intensity and are likely to burn and

smolder for an extended time, resulting in increased effects to soils (see Fire and Fuels Specialist Report). According to Busse and others (2010), 60 degrees Celsius is the “lethal” threshold in which soil will begin to experience negative effects (root death), and at 20 tons per acre the temperature would be above the 60 degrees Celsius threshold for roughly 2 hours at a depth of 2.5 cm. At 80 tons per acre the soil would be heated to greater than 60 °C for approximately 6 hours, with a maximum temperature above 200°C. Above 200 °C, loss of soil C and N may be seen, with reductions in soil aggregate stability. High-severity fire effects to soils result in an increased risk of erosion, sedimentation and degraded soil productivity (Stoof et al., 2013).

Hydrophobic layers form in the soil at around 250 degrees Celsius (Doerr, 2000). High-severity fire has the potential to cause soils to become hydrophobic (water-repellent) immediately following a fire, resulting in increased runoff of precipitation that would otherwise infiltrate the soil surface. Increased runoff can cause soil erosion at rates in excess of rates for unburned bare ground. Such high-severity fire effects would directly impact soil health and site productivity. Intense, long duration heat near the soil surface could result in hydrophobic conditions, increased bare soil, potential for runoff, soil detachment, large scale erosion, slower recovery of effective vegetative cover, and sedimentation into project-area streams, including those supplying municipal water to Helena. Fire intensity describes the physical combustion process of energy release from organic matter. Fire severity can have different meanings, but in the literature its basis centers on the loss or decomposition of organic matter, both above and below ground (Keeley, 2009).

Based on current conditions, future climate projections, and fuels loadings, it is possible that large areas would be severely burned under wildfire conditions, far in excess of the Regional Soil Quality Standards strived for when implementing management activities. The effect would be more severe than a prescribed mixed severity fire resulting in a mosaic burn pattern conducted under optimal soil and climatic conditions with proper supervision. Refer to the Hydrology Specialist Report for modeled post fire sediment yield estimates.

Irreversible/Irretrievable Commitments

An irreversible commitment represents a total loss of a resource, which cannot be replaced. An irretrievable commitment represents a temporary loss of a resource, which can be replaced over time. Large areas of severely burned soils, likely resulting in accelerated erosion, topsoil/organic matter loss, impaired water quality, decreased site productivity, mass soil movement, etc. would take decades to centuries to replace therefore representing an irretrievable commitment. There are no known irreversible commitments.

Cumulative Effects

Because no new management activities are proposed with alternative 1, no new soil cumulative effects would be predicted. However, past, ongoing and reasonably foreseeable management activities, such as previous timber harvest, livestock grazing, roads, OHV use and minerals activity would continue to affect soil resources similar to impacts described for the affected environment assessment in this analysis.

Alternative 2

Direct/Indirect Effects

A summary list of landtypes and acres treated by vegetation treatment activities proposed for alternative 2 can be found in the Soils Project Record. More detailed information disclosing the specific landtypes treated within each proposed vegetation treatment unit can be found in a spreadsheet in the soil project record.

Under alternative 2, 42 miles of temporary road construction would have short-term impact on approximately 126 acres of soil. Approximately 0.5 miles of temporary roads would be constructed on an already existing disturbance template. For the purposes of this analysis, soil effects from temporary roads are included with the area of detrimental soil disturbance associated with tractor yarding units, because the temporary roads would be constructed for ground-based logging equipment to access these units. However, reclamation by full obliteration of temporary roads upon conclusion of proposed vegetation treatments would facilitate long-term recovery of soil productivity on these 126 acres and would require no maintenance. Approximately 13 miles of temporary road are proposed on soils with a severe subsurface erosion hazard with 31 miles proposed on granitic soils.

There are 4,223 acres of treatments on Mollisol soils that would promote restoring the carbon storage potential of the soils through a more open forested environment. These treatments include improvement harvests, precommercial thinning and prescribed fire.

Irreversible/Irretrievable Commitments

An irreversible commitment represents a total loss of a resource, which cannot be replaced. An irretrievable commitment represents a temporary loss of a resource, which can be replaced over time. Detrimental soil disturbance associated with the Tennmile - South Helena Project would be an irretrievable commitment of soil resource; soils would recover over the long-term following detrimental disturbance from proposed vegetation management actions. The decrease in soil productivity during this recovery time would represent the irretrievable impact of implementing vegetation treatment activities with Tennmile - South Helena Project. There are no known irreversible commitments under this alternative.

Cumulative Effects

Soil Disturbance Treatment Scenarios

Detrimental soil disturbance is estimated for the following scenarios which represent the range and various combinations of treatments that could result in soil disturbance under this alternative in addition to field verified existing soil condition. Detrimental soil disturbance estimates for units requiring additional mitigations can be found in Table 175. A table with all units and predicted detrimental soil disturbance can be found in the Project File. The estimated detrimental soil disturbance for the project area is 2,292 acres or 10 percent of the total activity acres for the project.

Table 175. Predicted Detrimental Soils Disturbance after activities for alternative 2 – only units requiring additional mitigations

Alt. 2 Proposed Treatment Units	Alt. 2 Treatment Unit Acres	Alt. 2 Percent DSD existing in Treatment Units	Alt. 2 Percent DSD from Harvest	Alt. 2 Percent DSD from Burning	Alt. 2 Percent DSD from Temp Roads	Alt. 2 Percent of Unit affected by road decom.	Alt. 2 Percent DSD after activities without mitigations	Mitigation 1: Summer log w/deferred burning	Mitigation 2: Winter log w/ burning	Mitigation 3: Winter log w/deferred burning
1	71	0.0	11.4%	2-10%	1.5%	- 0.5%	14.3% to 22.2%	12.4%	9.2% to 17.1%	7.3%
3	78	0.0	11.6%	2-10%	0.0%	- 0.0%	13.6% to 21.6%	11.6%	8.5% to 16.5%	6.5%
4	25	0.0	11.5%	2-10%	1.3%	- 3.2%	11.5% to 19.4%	9.6%	6.4% to 14.3%	4.5%
5	53	0.0	11.5%	2-10%	1.2%	- 0.8%	14.7% to 22.6%	12.7%	9.6% to 17.5%	7.6%
6	29	3.3	9.1%	5.0%	0.0%	- 0.0%	17.4%	12.4%	12.3%	7.3%
7b	152		9.1%	2-10%	0.0%	- 0.0%	11.1% to 19.1%	9.1%	6.0% to 14.0%	4.0%
7d	244		9.1%	2-10%	0.0%	- 0.0%	11.1% to 19.1%	9.1%	6.0% to 14.0%	4.0%
8g	124		9.1%	2-10%	0.0%	- 0.2%	10.9% to 18.9%	8.9%	5.8% to 13.8%	3.8%
8k	82		9.1%	2-10%	0.0%	- 0.0%	11.1% to 19.1%	9.1%	6.0% to 14.0%	4.0%
8n	95		9.1%	2-10%	0.0%	- 0.2%	10.9% to 18.9%	8.9%	5.8% to 13.8%	3.8%
8q	187		9.1%	2-10%	0.0%	- 0.0%	11.1% to 19.1%	9.1%	6.0% to 14.0%	4.0%
9b	29		11.3%	5.0%	2.7%	- 0.0%	18.8%	14.0%	13.7%	8.9%
11	523	0.0	11.4%	2-10%	1.8%	- 0.0%	15.1% to 23.0%	13.2%	10.0% to 17.9%	8.1%
14	40	0.0	11.4%	2-10%	1.7%	- 0.0%	15.0% to 22.9%	13.0%	9.9% to 17.8%	7.9%

Alt. 2 Proposed Treatment Units	Alt. 2 Treatment Unit Acres	Alt. 2 Percent DSD existing in Treatment Units	Alt. 2 Percent DSD from Harvest	Alt. 2 Percent DSD from Burning	Alt. 2 Percent DSD from Temp Roads	Alt. 2 Percent of Unit affected by road decom.	Alt. 2 Percent DSD after activities without mitigations	Mitigation 1: Summer log w/deferred burning	Mitigation 2: Winter log w/ burning	Mitigation 3: Winter log w/deferred burning
15	70	0.0	11.3%	2-10%	2.9%	- 0.0%	16.1% to 23.9%	14.2%	11.0% to 18.8%	9.1%
16	18	0.0	11.6%	2-10%	0.0%	- 0.1%	13.5% to 21.5%	11.5%	8.4% to 16.4%	6.4%
17	72	0.0	11.6%	2-10%	0.4%	- 0.0%	14.0% to 21.9%	12.0%	8.9% to 16.8%	6.9%
18	134		11.3%	2-10%	2.2%	- 0.0%	15.5% to 23.3%	13.5%	10.4% to 18.2%	8.4%
19	169	0.0	11.3%	2-10%	2.4%	- 0.0%	15.7% to 23.5%	13.7%	10.6% to 18.4%	8.6%
20	85	0.0	11.6%	2-10%	0.0%	- 0.0%	13.6% to 21.6%	11.6%	8.5% to 16.5%	6.5%
21	101	0.0	11.4%	2-10%	1.6%	- 0.0%	15.0% to 22.9%	13.0%	9.9% to 17.8%	7.9%
22	130	0.0	11.5%	2-10%	0.7%	- 1.2%	13.0% to 21.0%	11.0%	7.9% to 15.9%	5.9%
23	90	0.0	11.4%	2-10%	1.5%	- 0.0%	14.9% to 22.8%	13.0%	9.8% to 17.7%	7.9%
24	78	0.0	11.5%	2-10%	0.5%	- 0.0%	14.1% to 22.0%	12.1%	9.0% to 16.9%	7.0%
26	223	0.0	11.4%	2-10%	1.5%	- 0.4%	14.5% to 22.4%	13%	9.1% to 16.9%	7.1%
27a	42	3.3	11.5%	2-10%	1.1%	- 3.2%	14.7% to 22.6%	13%	9.6% to 17.5%	7.6%
27b	54		11.4%	2-10%	1.4%	- 0.0%	14.8% to 22.7%	12.8%	9.7% to 17.6%	7.7%
27c	27		11.6%	2-10%	0.0%	- 2.5%	11.1% to 19.1%	9.1%	6.0% to 14.0%	4.0%

Alt. 2 Proposed Treatment Units	Alt. 2 Treatment Unit Acres	Alt. 2 Percent DSD existing in Treatment Units	Alt. 2 Percent DSD from Harvest	Alt. 2 Percent DSD from Burning	Alt. 2 Percent DSD from Temp Roads	Alt. 2 Percent of Unit affected by road decom.	Alt. 2 Percent DSD after activities without mitigations	Mitigation 1: Summer log w/deferred burning	Mitigation 2: Winter log w/ burning	Mitigation 3: Winter log w/deferred burning
29	84	0.0	11.6%	2-10%	0.3%	- 0.0%	13.8% to 21.8%	11.8%	8.7% to 16.7%	6.7%
30	92	0.0	11.3%	2-10%	2.9%	- 0.0%	16.1% to 23.9%	14.2%	11.0% to 18.8%	9.1%
31	14	0.0	11.5%	2-10%	0.9%	- 0.0%	14.4% to 22.3%	12.4%	9.3% to 17.2%	7.3%
32	47	0.0	11.2%	2-10%	3.0%	- 0.0%	16.2% to 24.0%	14.3%	11.1% to 18.9%	9.2%
33	39	0.0	11.6%	2-10%	0.3%	- 0.0%	13.9% to 21.8%	11.9%	8.8% to 16.7%	6.8%
35	53	0.0	11.6%	2-10%	0.0%	- 0.0%	13.6% to 21.6%	11.6%	8.5% to 16.5%	6.5%
36	193		11.6%	2-10%	0.0%	- 0.0%	13.6% to 21.6%	11.6%	8.5% to 16.5%	6.5%
39b	85		11.5%	5.0%	0.6%	- 0.0%	17.1%	12.1%	12.0%	7.0%
39c	43		11.3%	2-10%	2.6%	- 0.0%	15.9% to 23.7%	13.9%	10.8% to 18.6%	8.8%
39g	8		10.7%	5.0%	8.2%	- 0.0%	23.4%	18.8%	18.3%	13.7%
39i	26		11.3%	5.0%	2.4%	- 0.0%	18.6%	13.7%	13.5%	8.6%
39s	19		11.6%	5.0%	0.0%	- 0.0%	16.6%	11.6%	11.5%	6.5%
40	22	3.3	9.0%	5.0%	1.5%	- 2.4%	16.3%	11.3%	11.2%	6.2%
49a	10		11.5%	2-10%	1.1%	- 0.0%	14.5% to 22.5%	12.6%	9.4% to 17.4%	7.5%
49c	88	3.3	11.5%	5.0%	1.0%	- 0.0%	20.7%	15.8%	15.6%	10.7%
50	96	0.0	11.3%	5.0%	2.7%	- 0.0%	18.9%	14.0%	13.8%	8.9%
51	62	5.0	11.4%	5.0%	2.1%	- 0.0%	23.3%	18.5%	18.2%	13.4%

Alt. 2 Proposed Treatment Units	Alt. 2 Treatment Unit Acres	Alt. 2 Percent DSD existing in Treatment Units	Alt. 2 Percent DSD from Harvest	Alt. 2 Percent DSD from Burning	Alt. 2 Percent DSD from Temp Roads	Alt. 2 Percent of Unit affected by road decom.	Alt. 2 Percent DSD after activities without mitigations	Mitigation 1: Summer log w/deferred burning	Mitigation 2: Winter log w/ burning	Mitigation 3: Winter log w/deferred burning
56a	31	0.0	11.6%	5.0%	0.0%	- 0.0%	16.6%	11.6%	11.5%	6.5%
56b	15	0.0	11.6%	5.0%	0.0%	- 0.0%	16.6%	11.6%	11.5%	6.5%
58	50	3.3	9.1%	5.0%	0.0%	- 0.0%	17.4%	12.4%	12%	7.3%
59a	23		11.6%	5.0%	0.0%	- 0.0%	16.6%	11.6%	11.5%	6.5%
69	30	18.9	11.6%	5.0%	0.0%	- 0.0%	<18.9%	<18.9%	<18.9%	<18.9%
71	42	3.1	11.6%	5.0%	0.0%	- 0.0%	19.7%	14.7%	14.6%	9.6%
73a	29	3.3	8.8%	5.0%	3.5%	- 0.0%	20.4%	15.6%	15.3%	10.5%
73b	88		11.3%	5.0%	2.4%	- 0.0%	18.6%	13.7%	13.5%	8.6%
73c	11	3.0	9.1%	5.0%	0.1%	- 0.0%	17.1%	12.1%	12.0%	7.0%
73d	43	3.0	9.0%	5.0%	1.2%	- 0.0%	18.1%	13.1%	13.0%	8.0%
73e	38		11.6%	5.0%	0.0%	- 0.0%	16.6%	11.6%	11.5%	6.5%
75	72	0.0	11.3%	5.0%	2.8%	- 0.0%	18.9%	14.1%	13.8%	9.0%
76	116	0.0	11.4%	5.0%	1.3%	- 0.0%	17.7%	12.8%	12.6%	7.7%
78	249	0.0	11.2%	5.0%	3.2%	- 0.0%	19.2%	14.4%	14.1%	9.3%
81	76	0.0	11.5%	5.0%	1.1%	- 0.0%	17.5%	12.6%	12.4%	7.5%
84b	40	0.0	11.2%	2-10%	3.2%	- 0.0%	16.4% to 24.1%	14.5%	11.3% to 19.0%	9.4%
84c	18	0.0	11.0%	5.0%	5.4%	- 0.0%	21.1%	16.4%	16.0%	11.3%
85a	50		0.0%	5.0%	1.8%	- 0.0%	18.1%	13.2%	13.0%	8.1%
85b	45		11.2%	5.0%	3.6%	- 0.0%	19.6%	14.8%	14.5%	9.7%
85c	22		11.5%	2-10%	1.1%	- 0.0%	14.6% to 22.5%	12.6%	9.5% to 17.4%	7.5%
89c	11		11.6%	5.0%	0.0%	- 0.0%	16.6%	11.6%	11.5%	6.5%

Alt. 2 Proposed Treatment Units	Alt. 2 Treatment Unit Acres	Alt. 2 Percent DSD existing in Treatment Units	Alt. 2 Percent DSD from Harvest	Alt. 2 Percent DSD from Burning	Alt. 2 Percent DSD from Temp Roads	Alt. 2 Percent of Unit affected by road decom.	Alt. 2 Percent DSD after activities without mitigations	Mitigation 1: Summer log w/deferred burning	Mitigation 2: Winter log w/ burning	Mitigation 3: Winter log w/deferred burning
94a	12		11.6%	5.0%	0.0%	- 0.0%	16.6%	11.6%	11.5%	6.5%
94d	22		11.3%	5.0%	2.6%	- 0.0%	18.8%	13.9%	13.7%	8.8%
94e	0		11.6%	5.0%	0.0%	- 0.0%	16.6%	11.6%	11.5%	6.5%
94f	35		11.2%	5.0%	3.3%	- 0.0%	19.3%	14.5%	14.2%	9.4%
94g	20		11.6%	5.0%	0.0%	- 0.0%	16.6%	11.6%	11.5%	6.5%
97a	226		11.3%	2-10%	2.6%	- 0.0%	15.8% to 23.6%	13.9%	10.7% to 18.5%	8.8%
98c	57	0.0	11.2%	2-10%	3.2%	- 0.0%	16.4% to 24.1%	14.4%	11.3% to 19.0%	9.3%
98g	68		11.5%	2-10%	0.7%	- 0.0%	14.2% to 22.1%	12.2%	9.1% to 17.0%	7.1%
98h	132		11.3%	2-10%	2.6%	- 0.0%	15.8% to 23.6%	13.9%	10.7% to 18.5%	8.8%
100a	10	0.0	11.6%	5.0%	0.0%	- 0.0%	16.6%	11.6%	11.5%	6.5%
100c	43		11.6%	5.0%	0.0%	- 0.0%	16.6%	11.6%	11.5%	6.5%
101	107	3.3	11.6%	5.0%	0.0%	- 0.0%	19.9%	14.9%	14.8%	9.8%
102a	17		11.6%	5.0%	0.0%	- 0.0%	16.6%	11.6%	11.5%	6.5%
103a	43	0.0	11.6%	5.0%	0.0%	- 0.0%	16.6%	11.6%	11.5%	6.5%
104	58	0.0	11.3%	2-10%	2.8%	- 0.0%	16.1% to 23.8%	14.1%	11.0% to 18.7%	9.0%
106a	260		11.3%	2-10%	2.3%	- 0.0%	15.6% to 23.4%	13.6%	10.5% to 18.3%	8.5%
106b	32		11.3%	5.0%	2.9%	- 0.0%	19.0%	14.2%	13.9%	9.1%
106c	20		11.4%	2-10%	1.6%	- 0.0%	14.9% to 22.8%	13.0%	9.8% to 17.7%	7.9%

Alt. 2 Proposed Treatment Units	Alt. 2 Treatment Unit Acres	Alt. 2 Percent DSD existing in Treatment Units	Alt. 2 Percent DSD from Harvest	Alt. 2 Percent DSD from Burning	Alt. 2 Percent DSD from Temp Roads	Alt. 2 Percent of Unit affected by road decom.	Alt. 2 Percent DSD after activities without mitigations	Mitigation 1: Summer log w/deferred burning	Mitigation 2: Winter log w/ burning	Mitigation 3: Winter log w/deferred burning
106d	43		11.3%	5.0%	2.4%	- 0.0%	18.6%	13.7%	13.5%	8.6%
106e	80		11.3%	2-10%	2.8%	- 0.0%	16.1% to 23.8%	14.1%	11.0% to 18.7%	9.0%
106f	28		11.3%	5.0%	2.3%	- 0.0%	18.5%	13.6%	13.4%	8.5%
106g	37		11.5%	2-10%	1.2%	- 0.0%	14.7% to 22.6%	12.7%	9.6% to 17.5%	7.6%
106h	18		11.2%	5.0%	3.8%	- 0.0%	19.7%	14.9%	14.6%	9.8%
110a	11	3.0	11.2%	2-10%	3.0%	- 0.0%	19.2% to 27.0%	17.3%	14.1% to 21.9%	12.2%
110b	86	3.0	11.4%	2-10%	1.9%	- 0.0%	18.3% to 26.1%	16.3%	13.2% to 21.0%	11.2%
110c	14	3.0	11.3%	2-10%	2.7%	- 0.0%	18.9% to 26.7%	17.0%	13.8% to 21.6%	11.9%
112	19	0.0	11.6%	5.0%	0.0%	- 0.0%	16.6%	11.6%	11.5%	6.5%
114a	9	3.0	11.6%	5.0%	0.1%	- 0.0%	19.7%	14.7%	14.6%	9.6%
114b	42	3.0	9.1%	5.0%	0.1%	- 0.0%	17.2%	12.2%	12.1%	7.1%
116c	437		9.1%	2-10%	0.0%	- 0.0%	11.1% to 19.1%	9.1%	6.0% to 14.0%	4.0%
116h	46		9.1%	2-10%	0.0%	- 0.0%	11.1% to 19.1%	9.1%	6.0% to 14.0%	4.0%
116i	130		9.1%	2-10%	0.0%	- 0.0%	11.1% to 19.1%	9.1%	6.0% to 14.0%	4.0%
117	64	3.0	11.4%	5.0%	1.5%	- 0.0%	20.8%	15.9%	15.7%	10.8%
118	168	0.0	11.3%	2-10%	2.6%	- 0.0%	15.8% to 23.6%	13.9%	10.7% to 18.5%	8.8%
121	19	0.0	9.0%	5.0%	1.4%	- 0.0%	15.3%	10.4%	10.2%	5.3%

Alt. 2 Proposed Treatment Units	Alt. 2 Treatment Unit Acres	Alt. 2 Percent DSD existing in Treatment Units	Alt. 2 Percent DSD from Harvest	Alt. 2 Percent DSD from Burning	Alt. 2 Percent DSD from Temp Roads	Alt. 2 Percent of Unit affected by road decom.	Alt. 2 Percent DSD after activities without mitigations	Mitigation 1: Summer log w/deferred burning	Mitigation 2: Winter log w/ burning	Mitigation 3: Winter log w/deferred burning
124a	22	3.3	9.1%	5.0%	0.0%	- 0.0%	17.4%	12.4%	12.3%	7.3%
124b	12	3.0	9.1%	5.0%	0.0%	- 0.0%	17.1%	12.1%	12.0%	7.0%
129a	213	0.0	9.0%	5.0%	1.5%	- 0.0%	15.4%	10.5%	10.3%	5.4%
130	46	0.0	11.5%	2-10%	0.8%	- 0.0%	14.3% to 22.2%	12.3%	9.2% to 17.1%	7.2%
138	35	3.3	8.7%	5.0%	4.1%	- 0.0%	20.9%	16.1%	15.8%	11.0%

Ground based harvest with broadcast and/or site prep burn.

Forty-five units are proposed for ground-based harvest with broadcast or site prep burn. Two units would require either a) summer mechanical operating conditions with post-mechanical treatment soil monitoring and potential deferred burning or b) winter mechanical operating conditions (units 4 and 27c). Several units would require either deferred burning in summer conditions or winter logging (units 1, 3, 5, 11, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 26, 27a, 27b, 29, 30, 31, 32, 33, 35, 36, 39c, 49a, 84b, 85c, 97a, 98c, 98g, 98h, 104, 106a, 106c, 106e, 106g, 118 and 130). Three units would require winter logging with deferred burning in order to meet Regional SQS (units 110a, 110b, and 110c).

Ground based harvest with handpile, jackpot, or underburn.

Forty units are proposed for this treatment scenario in alternative 2. One of these units meets Forest Plan or Regional SQS without additional mitigations. Several units would require either either a) summer mechanical operating conditions with post-mechanical treatment soil monitoring and potential deferred burning or b) winter mechanical operating conditions (units 9b, 39b, 39i, 39s, 50, 56a, 56b, 59a, 71, 73b, 73e, 75, 76, 78, 81, 85a, 85b, 89c, 94a, 94d, 94e, 94f, 94g, 100a, 100c, 101, 102a, 103a, 106b, 106d, 106f, 106h, 112, and 114a). Four units would require winter logging with deferred burning in order to meet Regional SQS (units 39g, 49c, 51, 84c, and 117). Unit 69 has previous disturbance over 15 percent and therefore requires soil restoration work to meet Regional SQS.

Ground based precommercial thin with handpile or jackpot burn.

Fifteen units are proposed as ground based precommercial thinning with handpile or jackpot burning. Eight of these units meet Forest Plan and Regional SQS without additional mitigations. Five units would require either a) summer mechanical operating conditions with post-mechanical treatment soil monitoring and potential deferred burning or b) winter mechanical operating conditions (units 6, 40, 73c, 73d, and 121). Two units would require winter operations with deferred burning in order to meet Regional SQS (units 73a and 138).

Ground based rearrangement of fuels with broadcast burn.

Eleven units are proposed with this combination of treatments. Nine units would require additional mitigations in order to meet Forest Plan and Regional SQS through either a) summer mechanical operating conditions with post-mechanical treatment soil monitoring and potential deferred burning or b) winter mechanical operating conditions (units 7b, 7d, 8g, 8k, 8n, 8q, 116c, 116h, and 116i).

Ground based rearrangement of fuels with handpile, jackpot, or underburn.

Eighty-seven units are proposed with this combination of treatments. Only five units would require additional mitigations in order to meet Forest Plan and Regional SQS through either a) summer mechanical operating conditions with post-mechanical treatment soil monitoring and potential deferred burning or b) winter mechanical operating conditions (units 58, 114b, 124a, 124b, and 129a).

Cable yarding tree removal with handpile, jackpot, underburn, broadcast and/or site prep burn.

Four units are proposed for cable harvest with prescribed fire. These units meet Forest Plan and Regional SQS without additional mitigations.

Hand rearrangement of fuels with handpile, jackpot, underburn, or broadcast burning.

Seventy-three units are proposed for hand rearrangement of fuels with prescribed burning. All of these units meet the Forest Plan and Regional SQS with proposed activities.

Hand precommercial thin with handpile or jackpot burn.

Three units are proposed for this treatment scenario. These units meet Forest Plan and Regional SQS without additional mitigations.

Alternative 3

Direct/Indirect Effects

A summary list of landtypes and acres treated by vegetation treatment activities proposed for alternative 3 can be found in the Soils Project Record. More detailed information disclosing the specific landtypes treated within each proposed vegetation treatment unit can be found in a spreadsheet in the soil project record.

Under alternative 3, 24 miles of temporary road construction would have short-term impact on approximately 72 acres of soil. For the purposes of this analysis, soil effects from temporary roads are included with the area of detrimental soil disturbance associated with tractor yarding units, because the temporary roads would be constructed for ground-based logging equipment to access these units. However, reclamation by full obliteration of temporary roads upon conclusion of proposed vegetation treatments would facilitate long-term recovery of soil productivity on these 72 acres and would require no maintenance. Approximately 6 miles of temporary road are proposed on soils with a severe subsurface erosion hazard with 16 miles proposed on granitic soils.

There are 3,794 acres of treatments on Mollisols that would promote restoring the carbon storage potential of the soils through a more open forested environment. These treatments include improvement harvests, precommercial thinning and prescribed fire.

Irreversible/Irretrievable Commitments

An irreversible commitment represents a total loss of a resource, which cannot be replaced. An irretrievable commitment represents a temporary loss of a resource, which can be replaced over time. Detrimental soil disturbance associated with the Tenmile - South Helena Project would be an irretrievable commitment of soil resource; soils would recover over the long-term following detrimental disturbance from proposed vegetation management actions. The decrease in soil productivity during this recovery time would represent the irretrievable impact of implementing vegetation treatment activities with Tenmile - South Helena Project. There are no known irreversible commitments under this alternative.

Cumulative Effects

Soil Disturbance Treatment Scenarios

Detrimental soil disturbance is estimated for the following scenarios which represent the range and various combinations of treatments that could result in soil disturbance under this alternative in addition to field verified existing soil condition. Detrimental soil disturbance estimates for units requiring additional mitigations can be found in Table 176. A table with all units and predicted detrimental soil disturbance can be found in the Project File. The estimated detrimental soil disturbance for the project area is 1,642 acres or 10 percent of the total activity acres for the project.

Table 176. Predicted detrimental soil disturbance after activities for alternative 3 – only units requiring additional mitigations

Alt. 3 Proposed Treatment Units	Alt. 3 Treatment Unit Acres	Alt 3. Percent DSD existing in Treatment Units	Alt. 3 Percent DSD from Harvest	Alt. 3 Percent DSD from Burning	Alt 2. Percent DSD from Temp Roads	Alt. 3 Percent of Unit affected by road decom.	Alt. 3 Percent DSD after activities without mitigations	Mitigation 1: Summer log w/deferred burning	Mitigation 2: Winter log w/ burning	Mitigation 3: Winter log w/deferred burning
4	25	0.0	9%	2-10%	1%	- 3.2%	9.1% to 17.0%	7.1%	4.0% to 11.9%	2.0%
5	53	0.0	9%	2-10%	1%	- 0.8%	11.4% to 19.3%	9.4%	6.3% to 14.2%	4.3%
6	29	3.3	9%	5%	0%	- 0.0%	17.4%	12.4%	12.3%	7.3%
11	523	0.0	9%	2-10%	2%	- 0.0%	12.7% to 20.5%	10.7%	7.6% to 15.4%	5.6%
14	40	0.0	9%	2-10%	2%	- 0.0%	12.6% to 20.5%	10.7%	7.5% to 15.4%	5.6%
15	70	0.0	9%	2-10%	3%	- 0.0%	13.7% to 21.4%	11.7%	8.6% to 16.3%	6.6%
16	18	0.0	9%	2-10%	0%	- 0.1%	11.0% to 19.0%	9.0%	5.9% to 13.9%	3.9%
17	72	0.0	9%	2-10%	0%	- 0.0%	11.5% to 19.4%	9.5%	6.4% to 14.3%	4.4%
18	395		9%	2-10%	2%	- 0.1%	12.9% to 20.7%	10.9%	7.8% to 15.6%	5.8%
19	169	0.0	9%	2-10%	2%	- 0.0%	13.2% to 21.0%	11.3%	8.1% to 15.9%	6.2%
20	85	0.0	9%	2-10%	0%	- 0.0%	11.1% to 19.1%	9.1%	6.0% to 14.0%	4.0%
22	130	0.0	9%	2-10%	1%	- 1.2%	10.5% to 18.5%	8.5%	5.4% to 13.4%	3.4%
23	90	0.0	9%	2-10%	2%	- 0.0%	12.5% to 20.3%	10.5%	7.4% to 15.2%	5.4%
24	78	0.0	9%	2-10%	1%	- 0.0%	11.6% to 19.5%	9.6%	6.5% to 14.4%	4.5%
29	40	0.0	9%	2-10%	0%	- 0.0%	11.1% to 19.1%	9.1%	6.0% to 14.0%	4.0%

Alt. 3 Proposed Treatment Units	Alt. 3 Treatment Unit Acres	Alt 3. Percent DSD existing in Treatment Units	Alt. 3 Percent DSD from Harvest	Alt. 3 Percent DSD from Burning	Alt 2. Percent DSD from Temp Roads	Alt. 3 Percent of Unit affected by road decom.	Alt. 3 Percent DSD after activities without mitigations	Mitigation 1: Summer log w/deferred burning	Mitigation 2: Winter log w/ burning	Mitigation 3: Winter log w/deferred burning
29a	45	0.0	9%	2-10%	1%	- 0.0%	11.6% to 19.5%	9.6%	6.5% to 14.4%	4.5%
33	39	0.0	9%	2-10%	0%	- 0.0%	11.1% to 19.1%	9.1%	6.0% to 14.0%	4.0%
35	42	0.0	9%	2-10%	0%	- 0.0%	11.1% to 19.1%	9.1%	6.0% to 14.0%	4.0%
39c	43		9%	2-10%	3%	- 0.0%	13.4% to 21.2%	11.5%	8.3% to 16.1%	6.4%
50	96	0.0	9%	5%	3%	- 0.0%	16.3%	11.4%	11.2%	6.3%
51	62	5.0	9%	5%	2%	- 0.0%	20.9%	16.0%	15.8%	10.9%
58	50	3.3	9%	5%	0%	- 0.0%	17.4%	12.4%	12.3%	7.3%
69	13	18.9	0%	5%	0%	- 0.0%	<18.9%	<18.9%	<18.9%	<18.9%
71	42	3.1	9%	5%	0%	- 0.0%	17.2%	12.2%	12.1%	7.1%
73a	29	3.3	8%	5%	3%	- 0.0%	20.4%	15.6%	15.3%	10.5%
73b	88		9%	5%	2%	- 0.0%	16.1%	11.2%	11.0%	6.1%
73d	43		9%	5%	1%	- 0.0%	15.1%	10.1%	10.0%	5.0%
75	72	0.0	9%	5%	3%	- 0.0%	16.5%	11.7%	11.4%	6.6%
76	116	0.0	9%	5%	1%	- 0.0%	15.2%	10.3%	10.1%	5.2%
78	249	0.0	9%	5%	3%	- 0.0%	16.7%	11.8%	11.6%	6.7%
101	107	3.3	9%	5%	0%	- 0.0%	17.4%	12.4%	12.3%	7.3%
106a	37		9%	2-10%	3%	- 0.0%	13.4% to 21.2%	11.4%	8.3% to 16.1%	6.3%
110b	58	3.0	9%	2-10%	3%	- 0.0%	16.8% to 24.5%	14.8%	11.7% to 19.4%	9.7%
114a	9	3.0	9%	5%	0%	- 0.0%	17.2%	12.2%	12.1%	7.1%
114b	42	3.0	9%	5%	0%	- 0.0%	17.2%	12.2%	12.1%	7.1%
117	64	3.0	9%	5%	2%	- 0.0%	18.4%	13.5%	13.3%	8.4%

Alt. 3 Proposed Treatment Units	Alt. 3 Treatment Unit Acres	Alt 3. Percent DSD existing in Treatment Units	Alt. 3 Percent DSD from Harvest	Alt. 3 Percent DSD from Burning	Alt 2. Percent DSD from Temp Roads	Alt. 3 Percent of Unit affected by road decom.	Alt. 3 Percent DSD after activities without mitigations	Mitigation 1: Summer log w/deferred burning	Mitigation 2: Winter log w/ burning	Mitigation 3: Winter log w/deferred burning
121	19	0.0	9%	5%	1%	- 0.0%	15.2%	10.3%	10.1%	5.2%
138	35	3.3	8%	5%	4%	- 0.0%	20.9%	16.1%	15.8%	11.0%
175	41		9%	5%	3%	- 0.0%	17.0%	12.2%	11.9%	7.1%
180	397		9%	2-10%	1%	- 0.3%	11.4% to 19.4%	9.5%	6.3% to 14.3%	4.4%

Ground based harvest with broadcast and/or site prep burn.

There are twenty-one units with ground based harvest and broadcast or site prep burn. Several units would require either a) summer mechanical operating conditions with post-mechanical treatment soil monitoring and potential deferred burning or b) winter mechanical operating conditions (units 4, 5, 16, 17, 20, 22, 24, 29, 29a, 33, 35 and 180). Nine units would require either deferred burning in summer conditions or winter logging (units 11, 14, 15, 18, 19, 23, 39c, 106a, and 110b).

Ground based harvest with handpile, jackpot, or underburn.

Twenty-one units are proposed for this treatment scenario in alternative 3. Ten units meet Forest Plan or Regional SQS without additional mitigations. Several units would require either a) summer mechanical operating conditions with post-mechanical treatment soil monitoring and potential deferred burning or b) winter mechanical operating conditions (units 50, 51, 71, 73b, 75, 76, 78, 101, 114a, 117, and 175). One unit would require winter logging with deferred burning in order to meet Regional SQS (unit 51).

Ground based precommercial thin with handpile or jackpot burn.

Twelve units are proposed for ground based precommercial thin with handpile or jackpot burn. Seven units would not require additional mitigation to meet Forest Plan or Regional SQS. Three units would require either a) summer mechanical operating conditions with post-mechanical treatment soil monitoring and potential deferred burning or b) winter mechanical operating conditions (units 6, 73d, and 121). Two units would require winter operations with deferred burning in order to meet Regional SQS (unit 73a and 138).

Ground based rearrangement of fuels with broadcast burn.

Two units have ground based rearrangement of fuels with broadcast burn and both units meet Forest Plan and Regional SQS without additional mitigations.

Ground based rearrangement of fuels with handpile, jackpot, or underburn.

Eighty-four units have ground based rearrangement of fuels with handpile, jackpot, or underburn. Only two units would require additional mitigations in order to meet Forest Plan and Regional SQS through either a) summer mechanical operating conditions with post-mechanical treatment soil monitoring and potential deferred burning or b) winter mechanical operating conditions (units 58 and 114b).

Cable yarding tree removal with handpile, jackpot, or underburn.

Two units in alternative 3 have this set of treatments. Both units meet Forest Plan and Regional SQS without additional mitigations.

Hand rearrangement of fuels with handpile, jackpot, underburn, or broadcast burning.

Fifty-four units have hand rearrangement of fuels with a prescribed fire treatment. All units except unit 69 meet Forest Plan and Regional SQS without additional mitigations. Unit 69 has previous disturbance over 15 percent and therefore requires soil restoration work be completed to meet Regional SQS.

Hand precommercial thin with handpile or jackpot burn.

Four units have been proposed in alternative 3 with hand precommercial thin and handpile or jackpot burn. All three units meet Forest Plan and Regional SQS as proposed.

Conclusions

Forest Service

No Action vs. Action Alternatives

Fire was historically the predominant natural disturbance in the Tennmile – South Helena project area. Due to current conditions and trends from fire suppression, higher tree stocking, pine beetle outbreak, and fuel accumulation would continue. Based on current conditions, future climate projections, and fuels loadings, it is possible that large areas would be severely burned under wildfire conditions, far in excess of the Regional Soil Quality Standards. The effect would likely be more severe than the timber harvest impacts and prescribed fire impacts proposed in the action alternatives.

Short-term Use vs. Long-term Soil Productivity

By including all resource protection measures, proposed actions for the Tennmile - South Helena Project would comply with Region 1 soil quality guidelines to limit detrimental soil disturbance and preserve soil productivity for future vegetative growth and soil health. Additionally, no cumulative effects are projected to occur as a result of design features and included mitigation.

Nonetheless, detrimental soil disturbance would occur in the short-term, within the 15 percent of the activity area limits as defined by R1 SQS. There would be a maximum of 2,239 acres of detrimental soil disturbance under alternative 2 (Table available in the Soil Resource Project Record), while 1,651 acres of detrimental soil disturbance would occur with alternative 3 (Table available in the Soil Resource Project Record). In alternative 2 there are 106 units requiring additional design features to meet Regional SQS and 40 units requiring these additional design measures in alternative 3. Areas affected by detrimental soil disturbance would include main skid trails, log landings and temporary roads for tractor harvest units, cable yarding corridors, and areas of severe burning in units treated with prescribed fire.

This detrimental soil disturbance would be a short-term impact because there would be a long-term trend for soil recovery through reclamation measures and/or natural recovery processes (i.e. frost heaving bio-perturbation, biomass input and nutrient cycling, etc.). Soils may take at least 50 years for recovery to pre-disturbance conditions where reclamation measures would be implemented, such as on temporary roads and log landings. Soils may take longer to recover to pre-disturbance conditions, perhaps at least 100 years, where only natural recovery processes would occur such as on main skid trails and cable yarding corridors.

Irreversible/Irretrievable Commitments

An irreversible commitment represents a total loss of a resource, which cannot be replaced. An irretrievable commitment represents a temporary loss of a resource, which

can be replaced over time. Detrimental soil disturbance associated with the Tennile - South Helena Project would be an irretrievable commitment of soil resource; soils would recover over the long-term following detrimental disturbance from proposed vegetation management actions. The decrease in soil productivity during this recovery time would represent the irretrievable impact of implementing vegetation treatment activities with Tennile - South Helena Project. There are no known irreversible commitments under the three action alternatives.

Unavoidable Adverse Consequences

As described in the section, “Short-term Use vs. Long-term Soil Productivity”, detrimental soil disturbance would occur under all action alternatives. However, it would still be within 15 percent detrimental soil disturbance of the activity area as defined by Region 1 Soil Quality Standards. This would be a short-term consequence, with a trend for soil recovery in the long-term.

USFS Forest Plan Consistency

It is my professional judgment that with the implementation of design features and additional resource protection measures with the proposed treatments, then all proposed actions for the Tennile - South Helena Project would comply with Region 1 soil quality guidelines to limit detrimental soil disturbance, as well as meet Helena Forest Plan and NFMA requirements to conserve site productivity (Table 177). I make this determination based on previous BMP audits documenting that soil and water Best Management Practices are effective when implemented successfully (MDNRC 2000, 2002, 2004, 2006, 2008, 2010, 2012, USDA Forest Service 2003a, 2003b, 2003c, 2003d, 2007, 2013, 2014b). This is accurate for all alternatives analyzed.

Table 177. Forest Plan consistency for all alternatives

Forest Plan Standards for Soil Resource	Project Consistency	
	No Action Alternative (Alternative 1)	Action Alternatives (Alternative 2 and Alternative 3)
1. In accordance with NFMA, RPA, and Multiple Use-Sustained Yield Act, all management activities will be planned to sustain site productivity. During project analysis, ground disturbing activities will be reviewed and needed mitigating actions prescribed.	Since no new activities are proposed under the no action alternative, continued compliance with the Helena National Forest Plan is expected.	The Tenmile - South Helena Project complies with Forest Plan soil guidance because effects from soil disturbance would not be an irreversible commitment of resources and thus would not cause permanent impairment of the productivity of the land in accordance with MUSY, RPA and NFMA. In addition, proposed ground disturbing activities have been reviewed for the Tenmile - South Helena Project and necessary design criteria have been prescribed.
2. Areas of decomposed granite soils will be identified and erosion control measures planned prior to any ground disturbing activities.	Since no new activities are proposed under the no action alternative, continued compliance with the Helena National Forest Plan is expected.	Granitic soils have been identified in the project area and the design criteria prescribed above have been prescribed to minimize erosion.
3. To reduce sedimentation associated with management activities, the highly sensitive granitic soils, which cover about 20 percent of the Forest, will have first priority for soil erosion control.	Since no new activities are proposed under the no action alternative, continued compliance with the Helena National Forest Plan is expected.	Granitic soils have been identified in the project area and the design criteria prescribed above have been prescribed to minimize erosion.

BLM Land and Resource Management Plan Consistency

It is my professional judgment that with the implementation of design features and additional resource protection measures with the proposed treatments, then all proposed actions for the Tenmile - South Helena Project would comply with management actions to limit soil impacts as well as meet the Land and Resource Management Plan requirements (Table 178). I make this determination based on previous BMP audits documenting that soil and water Best Management Practices are effective when implemented successfully (MDNRC 2000, 2002, 2004, 2006, 2008, 2010, 2012, USDA Forest Service 2003a, 2003b, 2003c, 2003d, 2007, 2013, 2014b). This is accurate for all alternatives analyzed.

Table 178. Land and resource management plan consistency for all alternatives

LRMP Management Actions for Soil Resource	Project Consistency	
	No Action Alternative (Alternative 1)	Action Alternatives (Alternative 2 and Alternative 3)
<p>1. BLM will continue to implement soil conservation measures and BMPs to meet these management objectives. Examples of measures and BMPs that will be applied throughout the BFO include:</p> <p>Seasonal or yearlong closures of specific road and trail sections to reduce soil erosion</p> <p>Design, enhancement, and maintenance of vegetated filter strips along critical waterways</p> <p>Integration of soil, groundwater, and surface water management to minimize stream channel degradation and improve groundwater and surface water quality. (Goals SR1, SR2, RV1, RV2, WR1, WR3, WR4)</p>	<p>Since no new activities are proposed under the no action alternative, continued compliance with the LMRP is expected.</p>	<p>Soil conservation measures have been applied to the project to minimize accelerated soil erosion and compaction and maintain surface soil water infiltration.</p> <p>Soil conservation measures have been applied to the project to maintain or improve soil health and fertility, prevent or minimize erosion and compaction while supporting multiple use management.</p>
<p>2. Soil conservation practices and soil BMPs will provide the basis for maintaining soil productivity, fertility, and stability, and maximizing infiltration of natural precipitation and minimizing runoff, soil erosion, and sedimentation. (Goals SR1, SR2, FW1, FS1, RV1, WR4).</p>	<p>Since no new activities are proposed under the no action alternative, continued compliance with the LMRP is expected.</p>	<p>Soil conservation measures have been applied to the project to provide the basis for maintaining soil productivity, fertility, and stability, and maximizing infiltration of natural precipitation and minimizing runoff, soil erosion, and sedimentation.</p>
<p>3. Consideration of soil conditions and types and their influence on management actions will occur on a case-by-case basis. Best Management Practices and mitigation measures will be implemented at the site-specific project level to maintain or improve the soil resource. Soils susceptible to compaction and erosion will receive greater consideration when assessing proposed activities. (Goals SR1, SR2, WR4)</p>	<p>Since no new activities are proposed under the no action alternative, continued compliance with the LMRP is expected.</p>	<p>Soil conservation measures have been applied to the project to minimize accelerated soil erosion and compaction and maintain surface soil water infiltration.</p>
<p>4. Soil compaction and erosion problems will be diagnosed using Land Health Standards. (Goals SR1, SR2)</p>	<p>Since no new activities are proposed under the no action alternative, continued compliance with the LMRP is expected.</p>	<p>Soil compaction and erosion risks have been identified in this assessment.</p>
<p>5. Appropriate mitigation or seasonal restrictions will be applied to activities in areas with significant soil compaction or accelerated erosion. (Goals SR1, SR2)</p>	<p>Since no new activities are proposed under the no action alternative, continued compliance with the LMRP is expected.</p>	<p>Appropriate mitigation or seasonal restrictions have been proposed in the resource protection measures for the project.</p>
<p>6. The BLM will re-seed disturbed areas where needed based on site-specific assessments. (Goals SR1, SR2, GS1, FW1, WF1)</p>	<p>Since no new activities are proposed under the no action alternative, continued compliance with the LMRP is expected.</p>	<p>The requirement to re-seed disturbed sites has been proposed in the resource protection measures for the project.</p>

Table 179. Project area landtype characteristics

Landtype	Acres	Landform	Geology	Soil Type	Surface Texture	Sensitivity
36-	13199	Rolling uplands	Granitic rock	Typic Cryoboralfs, fine-loamy, mixed	Very gravelly sandy loam	Granitic Map Units: Highly erodible soils
76-	3180	Glaciated mountain slopes	Granitic rock	Typic Cryochrepts, loamy-skeletal, mixed	Very gravelly sandy loam	Loess w/ Volcanic Ash Map Units: Vulnerable to compaction & Highly erodible soils, Granitic Map Units: Highly erodible soils
21-	3061	Mountain slopes	Limestone and calcareous sandstone	Lithic Ustochrepts, loamy-skeletal, carbonatic, frigid, Typic Ustochrepts, loamy-skeletal, carbonatic, frigid	Bedrock, extremely gravelly loam	(blank)
260	2776	Rolling uplands	Granitic rock	Typic Haploborolls, sandy, mixed, Typic Ustochrepts, sandy, mixed, frigid	Loamy coarse sand, gravelly loamy sand	Granitic Map Units: Highly erodible soils
36B	2738	Mountain slopes	Granitic rock	Typic Cryoboralfs, fine-loamy, mixed, Aquolls	Very gravelly sandy loam, gravelly sandy loam, loamy sand	Wet Soil Map Units, Granitic Map Units: Highly erodible soils
12C	2704	Moraines	Glacial till from granitic rocks	Andic Cryochrepts, loamy-skeletal, mixed	Very cobbly sandy loam	Wet Soil Map Units, Loess w/ Volcanic Ash Map Units: Vulnerable to compaction & Highly erodible soils, Granitic Map Units: Highly erodible soils
26-	2532	Rolling uplands	Granitic rock	Typic Ustochrepts, sandy, mixed, frigid, frigid, Mollic Eutroboralfs, fine-loamy, mixed	Gravelly loamy sand, sandy clay loam and sandy loam	Granitic Map Units: Highly erodible soils
36A	2452	Rolling uplands	Granitic rock	Argic Cryoborolls, fine-loamy, mixed	Gravelly sandy clay loam	Granitic Map Units: Highly erodible soils
57-	2159	Mountain ridges	Basalts, tuffs, andesites and breccias	Typic Cryochrepts, loamy-skeletal, mixed	Extremely cobbly loam	Loess w/ Volcanic Ash Map Units: Vulnerable to compaction & Highly erodible soils
80-	1678	Cirque headwalls and basins	Metasedimentary rock	(blank)	Bedrock	(blank)
47B	1624	Mountain slopes	Basalts, tuffs, andesites and breccias	Typic Cryoboralfs, loamy-skeletal, mixed	Extremely cobbly loam	(blank)

Landtype	Acres	Landform	Geology	Soil Type	Surface Texture	Sensitivity
77-	1537	Mountain ridges	Basalts, tuffs, andesites and breccias	Typic Cryochrepts, loamy-skeletal, mixed, Lithic Cryochrepts, loamy-skeletal, mixed	Very cobbly loam, bedrock	Loess w/ Volcanic Ash Map Units: Vulnerable to compaction & Highly erodible soils
39A	1479	Mountain slopes	Argillites, siltites and quartzites	Lithic Cryoborolls, loamy-skeletal, mixed, Argic Cryoborolls, loamy-skeletal, mixed	Bedrock, very cobbly loam	(blank)
47-	1446	Mountain slopes	Basalts, tuffs, andesites and breccias	Typic Cryoboralfs, loamy-skeletal, mixed, Mollic Cryoboralfs, loamy-skeletal, mixed	Extremely cobbly coarse sandy loam, extremely cobbly loam	(blank)
136	1387	Moraines	Glacial drift	Aquolls, Typic Cryochrepts, loamy-skeletal, mixed	—	Wet Soil Map Units
76A	1381	Glaciated mountain ridges	Granitic rock	Typic Cryochrepts, loamy-skeletal, mixed	Very gravelly sandy loam	Loess w/ Volcanic Ash Map Units: Vulnerable to compaction & Highly erodible soils
120	1303	Glaciated mountain slopes	Granitic rock	Typic Cryoboralfs, loamy-skeletal, mixed, Typic Cryochrepts, loamy-skeletal, mixed	Very gravelly sandy loam, extremely cobbly sandy loam	Granitic Map Units: Highly erodible soils
31-	1284	Mountain slopes	Limestone and calcareous sandstone	Typic Ustochrepts, loamy-skeletal, carbonatic, frigid, Typic Calciborolls, loamy-skeletal, carbonatic	Extremely gravelly silt loam	(blank)
56A	1227	Mountain slopes	Granitic rock	Typic Cryochrepts, loamy-skeletal, mixed	Extremely cobbly sandy loam	Granitic Map Units: Highly erodible soils
39-	1080	Mountain slopes	Argillites, siltites and quartzites	Typic Ustochrepts, loamy-skeletal, mixed, frigid	Extremely channery sandy loam	(blank)
790	1033	Glaciated mountain slopes	Glacial till from meta-sedimentary rock	Typic Cryochrepts, loamy-skeletal, mixed, Typic Cryoboralfs, loamy-skeletal, mixed	Extremely channery loam very stony loam	Loess w/ Volcanic Ash Map Units: Vulnerable to compaction & Highly erodible soils
49-	969	Mountain slopes	Argillites, siltites and quartzites	Typic Cryoboralfs, loamy-skeletal, mixed, Mollic Cryoboralfs, loamy-skeletal, mixed	Extremely gravelly silt loam	(blank)

Landtype	Acres	Landform	Geology	Soil Type	Surface Texture	Sensitivity
86-	945	Glacial trough walls	Granitic rock	Typic Ustochrepts, loamy-skeletal, mixed, frigid	Extremely gravelly sandy loam,	Granitic Map Units: Highly erodible soils
14C	843	Basins and toeslopes	Colluvial deposits from basalt and metasedimentary rocks	Typic Cryochrepts, loamy-skeletal, mixed	Very cobbly loam	Colluvial Map Units: Slump-prone and wet soils, Wet Soil Map Units
210	666	Mountain slopes	Limestone and calcareous shale or argillite	Lithic Ustochrepts, loamy-skeletal, carbonatic, frigid, Typic Ustochrepts, loamy-skeletal, carbonatic, frigid	Bedrock, extremely gravelly loam, silt loam	(blank)
100	612	Flood plains and terraces	Mixed alluvium	Borolls	————	Wet Soil Map Units, Flood Plains & Terrace Map Units: Flood-prone areas and wet soils
360	610	Mountain ridges	Granitic rock	Typic Cryoboralfs, fine-loamy, mixed, Argic Cryoborolls, fine-loamy, mixed	Very gravelly sandy clay loam, very gravelly sandy loam	Granitic Map Units: Highly erodible soils
14-	576	Basins and toeslopes	Colluvial deposits from basalt and metasedimentary rocks	Typic Cryochrepts, loamy-skeletal, mixed	Very cobbly loam	Colluvial Map Units: Slump-prone and wet soils, Wet Soil Map Units
32A	527	Dip slopes	Limestone and calcareous sandstone	Calcic Cryoborolls, loamy-skeletal, carbonatic	Extremely gravelly silt loam	(blank)
77A	507	Mountain ridges	Basalts, tuffs, andesites and breccias	Argic Cryoborolls, loamy-skeletal, mixed, Lithic Cryoborolls, loamy-skeletal, mixed	Very cobbly loam, bedrock	(blank)
90-	417	Glacial trough walls	Metasedimentary rock and basalt	Andic Cryochrepts, loamy-skeletal, mixed, Typic Cryoboralfs, loamy-skeletal, mixed	Very cobbly loam	Loess w/ Volcanic Ash Map Units: Vulnerable to compaction & Highly erodible soils
77B	352	Mountain slopes	Basalts, tuffs, andesites and breccias	Typic Cryochrepts, loamy-skeletal, mixed	Extremely cobbly loam	Loess w/ Volcanic Ash Map Units: Vulnerable to compaction & Highly erodible soils
87-	276	Glacial trough walls	Metasedimentary rock and basalt	Typic Ustochrepts, loamy-skeletal, mixed, frigid	Extremely channery loam, bedrock	(blank)

Landtype	Acres	Landform	Geology	Soil Type	Surface Texture	Sensitivity
89-	272	Glacial trough walls	Granitic rock	Typic Cryochrepts, loamy-skeletal, mixed	Extremely gravelly sandy loam, bedrock	Loess w/ Volcanic Ash Map Units: Vulnerable to compaction & Highly erodible soils, Granitic Map Units: Highly erodible soils
390	259	Mountain slopes	Argillites, siltites and quartzites	Typic Haploborolls, loamy-skeletal, mixed, Typic Eutroboralfs, loamy-skeletal, mixed	Very cobbly loam, extremely gravelly loam	(blank)
12B	248	Moraines	Glacial till	Typic Cryochrepts, loamy-skeletal, mixed	Very cobbly loam	Wet Soil Map Units, Loess w/ Volcanic Ash Map Units: Vulnerable to compaction & Highly erodible soils
791	198	Cirque basins	Glacial till from meta-sedimentary rock	Andic Cryochrepts, loamy-skeletal, mixed	Very stony loam	Loess w/ Volcanic Ash Map Units: Vulnerable to compaction & Highly erodible soils
15-	177	Landslides	Limestone, basalt and metasedimentary rock	Mollic Cryoboralfs, clayey-skeletal, mixed	Very gravelly silty clay loam	Landslide Map Units: Landslide-prone and wet soils, Wet Soil Map Units
14A	173	Basins and toeslopes	Colluvial deposits from metasedimentary rocks	Argic Cryoborolls, loamy-skeletal, mixed	Very cobbly loam	Colluvial Map Units: Slump-prone and wet soils, Wet Soil Map Units
32-	133	Dip slopes	Limestone and calcareous sandstone	Mollic Cryoboralfs, loamy-skeletal, mixed, Calcic Cryoborolls, loamy-skeletal, carbonatic	Extremely gravelly silt loam, extremely gravelly loam	(blank)
W-0	108	Water	(blank)	(blank)	(blank)	(blank)
14B	59	Basins and toeslopes	Colluvial deposits from limestone, basalt and metasedimentary rock	Typic Cryoboralfs, clayey-skeletal, mixed	Very cobbly silty clay loam	Colluvial Map Units: Slump-prone and wet soils, Wet Soil Map Units
69-	45	Mountain ridges	Non-calcareous igneous or metamorphic rock	Typic Cryumbrepts, loamy-skeletal, mixed	Very gravelly sandy loam	(blank)

Landtype	Acres	Landform	Geology	Soil Type	Surface Texture	Sensitivity
49A	42	Mountain ridges	Argillites, siltites and quartzites	Argic Cryoborolls, loamy-skeletal, mixed	Very cobbly loam	(blank)
12A	41	Moraines	Glacial till	Typic Cryoboralfs, loamy-skeletal, mixed	Very stony sandy loam	Wet Soil Map Units
110	14	Alluvial fans	Alluvial deposits	Typic Argiborolls, loamy-skeletal, mixed, Typic Ustochrepts, loamy-skeletal, mixed, frigid	Very gravelly clay loam, very gravelly sandy loam	Alluvial Fan MU: Flood-prone areas
57A	12	Mountain ridges	Basalts, tuffs, andesites and breccias	Typic Cryochrepts, loamy-skeletal, mixed	Extremely cobbly loam	Loess w/ Volcanic Ash Map Units: Vulnerable to compaction & Highly erodible soils
470	8	Mountain slopes and ridges	Basalts, tuffs, andesites and breccias	Typic Cryoboralfs, loamy-skeletal, mixed, Argic Cryoborolls, loamy-skeletal, mixed	Very stony loam, extremely stony loam	(blank)
12D	1	Moraines	Glacial till from granitic rocks	Typic Cryoboralfs, loamy-skeletal, mixed	Very cobbly sandy loam	Wet Soil Map Units

Table 180. Landtype acres by BLM unit

Unit	164E	286E	301B	386E	486F	61E	63F	664E	685F	84F	85F	885F
139		3				64			2	14		
140		150		33		1						
142a		46				1	0					
142b						24	8					
143a		184										
143b		59										
146			3					50				82
147								27				
148	12							8				5
163	2		1					4				6
164			2									19
165	8		2									9
166a	13		1									0
166b	0		4					0				9
167			1					13	7			
168	1											1
169	14							3				
170								2				
171		1		37	2							
172						9	28			20	22	

Hydrology

Introduction

The Tenmile – South Helena project area is located primarily in the Tenmile and Prickly Pear Creek drainages. The action alternatives would treat approximately 18,112 to 24,308 acres with a range of harvest and burning prescriptions. The Hydrology Specialist Report addresses potential project-related and cumulative impacts on water resources—specifically, water quality and quantity in the streams within and downstream of the project area, as well as riparian area and wetland condition and function within the project area.

There are two streams in the project area, Tenmile Creek and Lump Gulch, with impaired stream reaches identified by the Montana Department of Environmental Quality (DEQ). The primary water quality concerns in the project area are related to sediment delivered from roadways as well as elevated in-channel sediment and metals from past mining activities. Undersized culverts on roads in the project area are also a concern in that these sites are often chronic sources of fine sediment, and a culvert failure during a peak-flow event would likely result in the entrainment and deposition of large volumes of sediment within stream channels.

Analysis presented in this report indicates that proposed activities under both action alternatives would have a net positive impact on water resources in project area watersheds, assuming that all appropriate resource protection measures are properly applied, and where issues or inadequacies are identified through field review, corrective actions are immediately taken. The elements of the project most likely to negatively impact water resources are temporary road crossings of streams and wetlands. Project elements that would result in improvements include wetland restoration, road decommissioning, and road improvements.

Measurement Indicators

Five measurement indicators were used to evaluate the effects of each alternative considered as part of the Tenmile – South Helena Project:

- Sediment from roads (average tons per year)
- Sediment from treatment units (tons per year, 10 percent probability)
- Equivalent clearcut area (ECA), a surrogate for water yield increase (acres)
- Roads decommissioned (miles within 150 feet of a stream)
- Wetland area affected (acres restored versus disrupted by temporary roads)

Sediment from roads and treatment units are selected as measurement indicators because sediment is the most likely water quality impairment to be generated by activities related to this project.

Water yield is a measurement indicator because increased water yield can be associated with forest management practices. Removing living trees can decrease the amount of water that is removed from the watershed by transpiration and canopy interception,

evaporation, and sublimation. This can result in more water in the stream in base flow and in lower-magnitude peak flow events, as well as potentially altering the timing of snowmelt-associated peak flows.

Parts of the project area are poorly drained with numerous wetlands. The project has the potential to impact wetlands temporarily from the construction of temporary roads. The project also would include the restoration of wetlands in the Upper Tenmile drainage.

Other important water resource issues in the project area include road/stream crossings, undersized culverts, wetlands, and riparian areas.

The analyses completed for this report and activities proposed under alternatives 2 and 3 comply with all applicable Forest Plan standards related to water resources, including forest-wide standards and standards for all pertinent management areas.

Documentation of compliance with applicable Forest Plan standards is provided in Appendix B of the DEIS.

Assumptions

Water Quality

The project would meet state water quality standards for streams if all reasonable land, soil, and water conservation practices are implemented and those practices “protect present and reasonably anticipated beneficial uses.” Of the beneficial uses designated for project area streams, the proposed activities are most likely to affect salmonid habitat through increased delivery of fine sediment to streams. Project design criteria are planned in order to mitigate sediment delivery to waterbodies. Other beneficial uses for project-area streams are unlikely to be affected by the proposed activities.

The effects of each alternative are based on the following assumptions related to water quality:

- Differences between erosion/sediment modeling estimates for various alternatives are adequate indicators of relative erosion and sedimentation magnitude from treatment units and roads.
- An uncontrolled wildfire in the project area in the absence of the proposed treatments likely would have broader-scale, higher-severity impacts to soils than proposed prescribed burning or pile burning.
- Prescribed fire would have predominantly low-severity impacts to soil, with a mosaic of some unburned and moderate-severity areas.
- The potential for sediment delivery from forested areas is highest in the first year following disturbance, and generally recovers to pre-disturbance conditions within three to five years.
- Road improvements (new drainage features, gravel application) may result in elevated erosion shortly after implementation, but would remain effective in reducing sediment delivery over a period of at least three years.

- The proposed temporary and short-term specified roads would be obliterated following use and would not require any long-term maintenance. Long-term specified roads would be placed in storage (stabilized surfaces and drainage features), and would not require any long-term maintenances.
- Decommissioning (obliteration) of roads may result in elevated erosion during and shortly after work, but would become stable and cease to be sediment sources within the first 1-2 years following disturbance.
- Proposed temporary/new road segments that cross streams or wetlands would develop sediment delivery points.
- Existing roads that would be reconstructed that do not currently have sediment delivery points would not develop sediment delivery points during project implementation.
- The project would have a minimal impact to drainage water yield as mainly dead trees would be cut.
- The Design Criteria and Best Management Practices identified in this document and in the Soils Specialist Report would be followed closely, and steps would be made to modify measures or practices in order to prevent watershed impacts if monitoring identifies the need.

Water Quantity

Water yield from a watershed is typically defined as the total volume of water leaving the basin via surface flow over a specified length of time. Annual water yield fluctuates based on climatic variability and changes in land use patterns.

Forest management practices and road construction may increase water yield by removing living trees from treated areas thus reducing the amount of water that is removed from the watershed by transpiration and canopy interception, evaporation, and sublimation. Increased water yield can be of concern because it may result in accelerated stream bank erosion or scour, potentially leading to habitat degradation and additional sedimentation. Conversely, increased water yield can have positive effects to physical habitat conditions during periods of low flow—particularly in dewatered reaches such as Tenmile Creek.

Widespread tree mortality from natural causes, such as insects, disease, or fire may similarly increase water yield (MacDonald and Stednick 2003). Removal of trees has a greater effect on the water balance than removal of smaller plants such as grasses, forbs, and shrubs, because large trees are generally more deeply rooted and thus have access to soil and groundwater for a longer period. Trees also transpire much more water per unit area of ground coverage than smaller plants. The effects of tree mortality or removal on water yield depend on many factors, the most important of which is the percentage of the watershed area affected. A statistically significant increase in stream flow is generally not measurable until at least 20% to 30% of a watershed's forest cover is removed (MacDonald and Stednick 2003). Additionally, annual precipitation must generally exceed 18 to 20 inches in order for a measurable yield increase to occur (Bosch and Hewlett 1982; MacDonald 1987). Upper elevations of the project area meet or exceed

this annual average value, especially in the upper Tenmile watershed, but most of the project area is at or below this approximate threshold.

Trees to be cut under the action alternatives would include a large proportion of dead trees resulting from insect infestation. Dead trees do not transpire and are thus not a substantial vector for groundwater leaving the basin. Similarly, dead trees denuded of needles intercept a small fraction of the precipitation intercepted by an intact canopy. Thus, removing these trees would have a negligible effect on the water balance in any watershed.

Physical Riparian Habitat

Proper functioning condition (PFC) is a qualitative method for assessing the condition of riparian areas (Prichard et al. 1998). The term PFC is used to describe both the assessment process and a defined, on-the-ground condition of a riparian area. The on-the-ground condition termed PFC refers to the functional level of physical riparian processes. PFC is a state of resiliency that would allow a riparian area to maintain its integrity during high-flow events. This resiliency allows an area to produce desired values over time, such as fish habitat, neotropical bird habitat, forage, and dissipation of flood energy. Riparian areas that are not functioning properly cannot sustain these values.

The project could affect riparian and other wetland habitats where trees would be removed. However, Montana's SMZ law would limit equipment use in these areas, and soil best management practices (BMPs) would be implemented to protect wetlands (see the project Soils Specialist Report for more information). This analysis assumes that by adhering to the design criteria described below, treatment activities would not impair hydrologic function of wetlands or riparian areas.

Information Used

Road Sediment Survey

Hydrology personnel completed a detailed roads sediment survey in 2014 for the project analysis. Parameters measured at the sites were those required by the WEPP:Roads model (Elliot et al. 1999). Data included road design, ditch/channel presence, road dimensions and gradient, surface material, buffer dimensions, and overall disturbance width and length. Data collected were of a degree of precision and accuracy that exceeds the sensitivity of WEPP:Roads sediment model.

Culvert Survey

Culvert surveys were completed by watershed personnel in 2014. Culverts within the area were surveyed in accordance with the guidelines contained in the National Inventory and Assessment Procedure for Identifying Barriers to Aquatic Organism Passage at Road-Stream Crossings (Clarkin et al. 2005). While the survey reviewed most culverts in the project area, the survey was not comprehensive.

Maintenance Project Plans

There are several ongoing or planned maintenance projects on roads in the project area (see project Transportation Specialist Report). Plans for these projects were reviewed in

consultation with the transportation specialist to determine which existing culverts had been replaced and which road improvements could affect surveyed road sediment sources.

Wetland Data

Trained watershed technicians identified areas with wetland characteristics within some areas of the Tenmile-South Helena project boundary. Surveys were done in all proposed treatment units. Data from the wetland survey are included in the project record. Potential wetlands were identified and located, but not formally delineated.

HNF Soil Survey

The Helena National Forest Soil Survey (USDA 2001) was used for data on soil types and characteristics of the study area. This information was used in modeling erosion and sedimentation.

Water Quality Data

Water quality data for Tenmile Creek and the surrounding tributaries has been monitored intermittently from 1997 through 2014 by USGS in conjunction with the Upper Tenmile Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) site. Monitored parameters include suspended sediment, metals (aluminum, arsenic, cadmium, copper, iron, lead, zinc). Additional water quality information was obtained from the Montana Department of Environmental Quality (DEQ) list of water-quality-limited streams (Montana DEQ, 2014) and the Lake Helena TMDL reports (US EPA, 2006).

Timber Stand Database

The timber stand database was used to assess past harvest activities and fire acreage by 6th-HUC drainage in the project area. This information was used in the analysis of potential project influence on water yield.

GIS Data

Numerous geographic information system (GIS) databases were used for spatial analyses. These databases include proposed vegetation treatment units, proposed and existing roads, and the national hydrography dataset (NHD) streams and 6th-HUC drainage boundaries. The accuracy of HNF GIS datasets is described in the GIS metadata files available in the project record.

Methodology

Scale of Analysis

The spatial scale of analysis for direct and indirect effects is at the 6th-HUC scale and includes six watersheds: Lump Gulch, Middle Prickly Pear Creek, Last Chance Gulch, Upper Tenmile Creek, Middle Tenmile Creek, and Lower Tenmile Creek. This scale was selected because the types of watershed impacts that are associated with forest management practices (increased sediment delivery and water yield) are discernible at the 6th-HUC drainage scale. Additionally, a smaller scale of analysis would require

significantly more data and effort without a commensurate increase in accuracy, given the tools available for analysis of watershed impacts. Finally, the 6th-HUC scale provides meaningful data in light of the regulatory framework. Typically, only a limited number of 6th -HUC streams are listed as impaired under Section 303(d) of the CWA (see Regulatory Framework), so the 6th -HUC scale allows a determination of the relative impacts (or improvements) to more sensitive streams. The size of the drainages used in this analysis range from roughly 14,000 acres for Last Chance Gulch to 28,000 acres for Lump Gulch. The cumulative effects analysis covers the combined area of these drainages and is approximately 131,200 acres in size. The Upper, Middle, and Lower Tenmile Creek watersheds make up part of the Tenmile Creek drainage. Lump Gulch, Last Chance Gulch, and Middle Prickly Pear Creek form a portion of the Prickly Pear drainage. The combined drainages will be useful in evaluating the cumulative effects of the project along with other management activities and natural fires.

The temporal scale of the analysis for environmental effects ranges from one to five years. The potential for short-term increases in erosion and sediment delivery associated with construction activities (e.g., for temporary road construction), would last as long as soil is disturbed or exposed. Once it has been stabilized with aggregate or vegetation has re-established after decommissioning, construction-related impacts would not be expected to persist (temporal scale of a few months to one year). For management activities on treatment units, the potential for sediment delivery is highest in the first year following disturbance and generally recovers to pre-disturbance levels within five years. Therefore, potential direct and indirect effects related to treatment units will be evaluated on a temporal scale of five years. The temporal scale for the cumulative effects analysis is greater than five years.

Methodologies

Sediment Modeling

The WEPP:Road model was used to predict sediment transport from roads to stream channels. Input data used to run this model were collected in the field in the aforementioned sediment surveys. The Disturbed WEPP model was used to predict erosion and sediment transport from treated hillslopes to stream channels.

The physical basis and performance of the WEPP models is discussed in the model documentation (Elliot et al., 1999, 2000) as well as several peer-reviewed papers (e.g. Larsen & MacDonald, 2007; Laflen et al., 2004; Elliott, 2004). In general, erosion prediction models have difficulty predicting sediment output with precision from a road, hillslope, or watershed at time scales useful to land managers. This is due mainly to a high degree of variability in site characteristics and in climatic variables. An average erosion/sediment delivery rate prediction can encompass this variability to some degree, although this value becomes much more useful when combined with a predicted probability that erosion would occur. The WEPP models incorporate climate data tailored to the individual site using PRISM data (Daly et al., 2001) and simulates daily events for a number of years specified by the user (30 years in this analysis) to determine the probability of sediment leaving the unit. The model incorporates individual precipitation event characteristics and antecedent conditions as well as site characteristics into its prediction of average annual runoff, erosion, and sediment yield values.

Culvert Analysis

A culvert risk analysis was done based on field measurements of culverts within the project area and flood frequency regression equations developed for the state of Montana (Parret & Johnson, 2004). The basis and accuracy of the regression equations are documented in the cited publication.

Water Yield

The ECA was used to estimate the impact on water yield of project activities as well as past and present activities throughout the six 6th-HUC watersheds in the project area (USDA Forest Service 1978, 1980). Water yield increases are derived from a variety of sources including the timber stand database which gives us a reasonable estimate of the equivalent clear-cut acres. Existing water yields were estimated using USGS regression curves (Parret et al., 1989) and PRISM precipitation data. Changes in water yield are difficult to predict at the landscape scale due to the high degree of complexity in the movement of water in mountainous forested environments. Even with exhaustive site data (i.e. transpiration rates, soil moisture and porosity, precipitation, stream flow, groundwater level and flow) available only in experimental settings, water yield estimates are approximate at best. The ECA model has been in use for several decades in the northern Rockies, and provides a reasonable estimation of the impacts of vegetation removal.

Hydrology, Affected Environment

Introduction

Five measurement indicators are used to analyze the direct and indirect effects related to water resources. These measurement indicators include sediment from roads and sediment from treatment units, measured in tons per year. These indicators were selected because sediment is the water quality impairment most likely to be generated by activities related to this project. The third measurement indicator is the percent water yield increase over current conditions. Increased water yield can be associated with forest management practices that remove large numbers of mature, living trees from the landscape and can result in changes to streamflow patterns and channel stability. The fourth indicator is the length of roadway within 150 feet of a waterbody that is decommissioned as part of this project. Based on local monitoring, roads beyond roughly 150 feet of stream channels generally do not deliver sediment to roads due to intervening undisturbed forest floor. However, decommissioning of routes that lack a surface connection to streams confers other resource benefits, including eventual re-establishment of subsurface flowpath connectivity. The fifth indicator is the acres of impaired wetlands restored within the project area.

Other important water resource issues in the project area include abandoned mine lands, riparian areas and number and condition of road/stream crossings.

Analysis Area

The area for the hydrology effects analysis consists of all drainages that intersect the Tennile-South Helena project boundary. This includes three 6th-HUC watersheds in the

Tenmile Creek basin and three 6th-HUC watersheds in the Prickly Pear Creek basin. The watersheds are Upper Tenmile Creek, Middle Tenmile Creek, Lower Tenmile Creek, Lump Gulch, Last Chance Gulch, and Middle Prickly Pear Creek. All of these drainages fall within the Lake Helena TMDL planning area (US EPA, 2006). For the analysis of cumulative effects, the combined area of these watersheds was considered.

The hydrology analysis area has varied geologic characteristics ranging in composition and age. The project area ranges from steep mountainous terrain along the Continental Divide to the broad valley bottom of Tenmile Creek. Elevation ranges from under 4000 feet to over 8000 feet and the average annual precipitation ranges from 16 inches to over 25 inches.

Lump Gulch

The Lump Gulch watershed is approximately 27,900 acres in size and about 33 percent (about 9,200 acres) is on HLCNF land within the Tenmile-South Helena project area. The watershed contains Lump Gulch and its tributaries, including Corral Gulch and Buffalo Creek. The headwaters of Lump Gulch initiate near Park Lake and run in an easterly direction until flowing into Prickly Pear Creek.

The Lump Gulch drainage is underlain with Cretaceous granodiorite with some upper valley bottoms covered with Quaternary glacial till and lower valley bottoms covered with alluvial deposits. The portions of Lump Gulch on HLCNF land are primarily characterized by steep mountainous terrain, with elevations reaching nearly 8000 feet on the western side of the drainage. The lowest elevation in the drainage is about 4040 feet and occurs off of HLCNF land near the confluence with Prickly Pear Creek. The average annual precipitation in the drainage is roughly 20 inches.

The entire length of Lump Gulch (from its headwaters to the confluence with Prickly Pear Creek) is listed by Montana DEQ as water-quality-limited (MT DEQ, 2014). The beneficial uses of drinking water and aquatic life are not fully supported due to impairments including total suspended solids and elevated metals. Sources of contamination have been identified as abandoned mines, roads, and silviculture harvesting.

Middle Prickly Pear Creek

The Middle Prickly Pear Creek watershed encompasses about 20,100 acres and only 4 percent (about 700 acres) is on HLCNF land within the Tenmile-South Helena project area. Portions of the drainage also encompass HLCNF land in the Elkhorn Mountains outside of the Tenmile-South Helena Project boundary. Most of the streams flowing through the Middle Prickly Pear Creek watershed within the Tenmile-South Helena project area have an intermittent flow regime.

The Middle Prickly Pear Creek catchment is primarily underlain by Cretaceous granodiorite with areas of Cretaceous, Jurassic, and Mississippian sedimentary rock. Valley bottoms are covered by Quaternary colluvium and alluvial deposits. The portion of the watershed within the project area is characterized by steep terrain, while the areas off HLCNF land are generally hilly with a broad valley following Prickly Pear Creek. The elevation ranges from about 6560 feet near Skihi Peak within the Tenmile-South

Helena project area to 4000 feet at the confluence of Prickly Pear and McClellan Creeks, which occurs off of HLCNF land. The average annual precipitation in the Middle Prickly Pear Creek watershed is about 16 inches.

The entire length of Prickly Pear Creek flowing through the Middle Prickly Pear drainage is listed by Montana DEQ as water quality limited (MT DEQ, 2014). The beneficial uses of drinking water and aquatic life are not fully supported due to impairments including alteration in streamside vegetation, physical substrate habitat alterations, sedimentation/siltation, water temperature, and elevated metals. Sources of these impairments have been identified as abandoned mines, industrial discharge, roads, loss of riparian habitat, channelization, and low flow alterations.

Last Chance Gulch

The Last Chance Gulch watershed covers about 13,700 acres and 53 percent (about 7,300 acres) is within the Tenmile-South Helena project area. This drainage covers the Grizzly Gulch and Orofino Gulch drainages, which run north from the project boundary towards Helena. The majority of the streams in this watershed have intermittent flow regimes and some have been altered by mining operations.

The Last Chance Gulch basin is underlain by Cretaceous granodiorite and Mississippian and Cambrian sedimentary rock. The portions of the watershed within the Tenmile-South Helena Project Area are characterized by steep terrain with high relief. The elevation ranges from 3920 feet to 6560 feet near Skihi Peak along the watershed boundary with the Middle Prickly Pear Creek watershed. The average annual precipitation within the Last Chance Gulch watershed is about 17 inches.

Last Chance Gulch does not contain any water quality limited streams listed by Montana DEQ. However, there may be some streams that have not been assessed for water quality by the state.

Upper Tenmile Creek

The Upper Tenmile Creek watershed is about 26,100 acres in size. This watershed includes Tenmile Creek and its tributaries from the Tenmile Creek headwaters to its confluence with Walker Creek below the HLCNF boundary. Tenmile Creek generally flows in a northward direction through the drainage. Approximately 80 percent (21,000 acres) of the watershed is on Forest Service (FS) land within the Tenmile-South Helena Project Boundary. Some BLM land proposed for treatment is in this drainage.

The Upper Tenmile Creek watershed is underlain primarily by Cretaceous granodiorite, rhyolites, and volcanic rock. The upper drainage bottoms are covered in Quaternary glacial till while the lower Tenmile valley is generally covered by Quaternary alluvial deposits. The watershed is characterized by steep mountainous terrain shaped by glaciation. Elevation ranges from 4600 feet to 8200 feet, with the highest elevations located in the southernmost part of the drainage. The Tenmile valley is fairly confined in the upper reaches, but becomes broader in the lower reach. Average annual precipitation is about 25 inches.

Within the Upper Tenmile Creek watershed, there are two segments of Tenmile Creek, the headwaters to Spring Creek and from Spring Creek to the Tenmile Water Treatment Plant, that are listed by Montana DEQ as water-quality-limited. The drinking water, aquatic life, primary contact recreation, and agricultural beneficial uses are not fully met. Impairments to the stream segments include alteration in streamside vegetation, sedimentation/siltation, low flow alterations, and elevated metals. Probable sources of these impairments are listed as abandoned mines, roads, and impacts from hydrostructure flow modification.

Middle Tenmile Creek

The Middle Tenmile Creek watershed contains about 23,000 acres and 37 percent (8,400 acres) is on HLCNF land within the Tenmile-South Helena project area. This drainage includes Tenmile Creek and tributaries from MacDonald Pass to below the Tenmile Water Treatment plant. The major tributaries to Tenmile Creek within this watershed include Walker Creek, Sweeney Creek, and Colorado Gulch. Tenmile Creek flows from west to east through this basin, downstream of the more confined reach in the Upper Tenmile watershed. Some BLM land proposed for treatment is in this drainage.

The Middle Tenmile Creek watershed is generally underlain by Cretaceous granodiorite and volcanic rock. The Tenmile Creek valley bottom is covered by Quaternary alluvial deposits and some upper tributaries are covered by Quaternary glacial till. The HLCNF portions of Middle Tenmile Creek are characterized by steep mountainous terrain, with elevations reaching 7200 feet along the Continental Divide in the western portion of the basin. The basin also includes the broad valley bottom of Tenmile Creek, which does not flow through HLCNF land along this reach. The lowest elevation of the basin, at about 4240 feet, occurs downstream from the Tenmile Creek Water Treatment Plant. Average annual precipitation in the Middle Tenmile Creek watershed is about 19 inches.

Two stream segments within the Middle Tenmile Creek basin are listed as water quality limited by Montana DEQ. The segments of Tenmile Creek from Spring Creek to the Tenmile Water Treatment Plant and from the treatment plant to the confluence with Prickly Pear Creek are listed for not fully supporting the drinking water, aquatic life, primary contact recreation, and agricultural beneficial uses. In addition to the impairments listed above for the segment from Spring Creek to the Tenmile Water Treatment Plant, the segment from the treatment plant to Prickly Pear Creek is listed as impaired due to elevated total nitrogen and phosphorus, and eutrophication/biological indicators. Probable causes of these additional impairments are listed as agriculture, irrigated crop production, and habitat modification.

Lower Tenmile Creek

The Lower Tenmile Creek watershed covers about 20,400 acres and about 13 percent (about 2,700 acres) is on HLCNF land within the Tenmile-South Helena project area. Tenmile Creek generally flows in a northeast direction and has several tributaries, including Blue Cloud Creek and Sevenmile Creek. Other tributaries in the Lower Tenmile Creek watershed have ephemeral or intermittent flow regimes. Some BLM land proposed for treatment is in this drainage.

The Lower Tennile drainage is underlain by Cretaceous granodiorite and Cambrian and Proterozoic sedimentary rocks. The Tennile Creek valley bottom is covered with Quaternary alluvial deposits. The HLCNF portions of the Lower Tennile Creek watershed include areas of steeper terrain, while the portions downstream of the Tennile-South Helena project area include the broad Tennile Creek valley. Elevation ranges from 3680 feet at the confluence with Prickly Pear Creek to 6500 feet near the divide with the Lump Gulch watershed. The average annual precipitation in the Lower Tennile Creek watershed is about 16 inches.

The segment of Tennile Creek from the Tennile Water Treatment Plant to the confluence with Prickly Pear Creek flows through the Lower Tennile Creek drainage and is listed as impaired by Montana DEQ. See the description above for Middle Tennile Creek for details on impairments to this stream segment and their probable causes.

Water Quality

Sediment

Sediment from Roads

A detailed road sediment survey was done for the project area in the Upper Tennile Creek, Last Chance Gulch, and Lump Gulch watersheds. The survey identified road segments that were hydraulically linked to stream channels and thus had the potential to deliver sediment to channels during runoff events. The survey only included roads on the HLCNF portions of these drainages. Some Forest Service spurs were not surveyed, due to lack of access. Unsurveyed spurs are generally in upland locations and/or overgrown, and are less likely to be chronic sources of sediment to streams. Although no FS routes within the project area were identified as sediment contributors for three of the drainages, other roads (e.g. private or county jurisdiction) are likely to contribute sediment to streams in those watersheds. No roads were surveyed on BLM parcels.

The concept of an average annual sediment load is somewhat misleading in that sediment delivery varies widely from year to year and from runoff event to runoff event. In WEPP the average annual value is equivalent to a two-year-return-interval flow event—there is an equal probability that the sedimentation could be greater or less than this value in any given year. The specific sediment value is not as useful as the comparison of values produced by the model for various project alternatives and the baseline condition.

Road segments identified as sediment sources in the survey were evaluated using the WEPP:Roads model. The model's output consists of predicted annual average sediment yield from the road surface and cut/fill slopes based on interpolated climate data and site-specific road characteristics (Table 181).

Table 181. Estimated average annual sediment delivery from roads to stream channels – existing conditions

Drainage	Average sediment delivery (tons/year)
Lump Gulch	1.7
Last Chance Gulch	3.7
Upper Tennile Creek	14.0

In addition to sediment delivery from roads, the presence of culverts (particularly those that are undersized) at road-stream crossings present a potential risk of stream sedimentation in the event of culvert failure. Culvert capacity was evaluated against the estimated 4 percent probability (25-year return interval). The analysis of project-area culverts on FS roads identified several that were undersized and/or damaged. These culverts are at greater risk of becoming plugged and failing during a high-water event, particularly in a post-wildfire setting. Additionally, two of these culverts are barriers to fish passage in habitat occupied by non-native trout (both on Travis Creek). No culverts were surveyed on BLM parcels.

Table 182. Undersized or damaged culverts – existing condition

Drainage	Undersized (#)	Damaged (#)
Lump Gulch	5	2
Last Chance Gulch	0	1
Upper Tenmile Creek	6	3

Sediment from Other Sources

Although roads are generally the dominant source of anthropogenic sediment in project area watersheds, there are additional natural and human-caused sources. Other activities have occurred on federal lands throughout the project area watersheds. Human-caused impacts include livestock grazing, mining (both placer and hard rock), timber management, special uses of various types, recreation, trail construction, trail maintenance, firewood cutting, fire suppression, prescribed fire, weed control, and utility corridors. Broad-scale estimates (not restricted to the project area) are detailed in the Lake Helena sediment TMDL report (US EPA, 2006).

Non-Sediment Impairments

A dominant impairment of water quality in the analysis area is elevated metals associated with past mining activities. Project area streams, including Tenmile Creek, Lump Gulch, and Prickly Pear Creek are impaired due to high concentrations of certain metals and metalloids (e.g. arsenic, cadmium, copper, lead, zinc). The Lake Helena metals TMDL report (US EPA, 2006) describes the sources and impacts of metals contamination in the project area.

Segments of Tenmile Creek are also listed as water quality limited on the Montana 303(d) list for elevated total nitrogen and phosphorus as well as eutrophication/biological indicators resulting from agriculture practices and irrigated crop production.

Prickly Pear Creek is listed as impaired due to elevated stream temperatures, and segments of Tenmile Creek are listed as impaired due to alterations in streamside vegetative covers, which may result in localized areas of elevated stream temperature. Alterations in streamside vegetative covers along Tenmile Creek from its headwaters to Spring Creek are attributed to construction and use of forest roads and impacts from abandoned mine lands. Alterations in streamside vegetative cover along Tenmile Creek from the Treatment Plant to its mouth are due to roads, land development, channelization, and habitat modification.

Water Yield

Increased water yield can be associated with forest management practices that remove living trees from the landscape. Removing living trees can decrease the amount of water that is lost from a watershed by transpiration and canopy interception, evaporation, and sublimation. This can result in an increased volume of water in stream baseflow and in an increase in the number of lower-magnitude peak flow events, as well as potentially altering the timing of snowmelt-associated peak flows.

In settings similar to the project area, MacDonald and Stednick (2003) estimated that roughly 20 to 30 percent of a watershed must be treated in order to attain a detectable increase in stream flow. Furthermore, research has suggested that in moisture-deficient landscapes, remaining trees tend to make use of most additional water made available through the reduction in transpiration brought about by tree removal (MacDonald, 1987). The percent area in ECA in the Tennile Creek drainage under current conditions was estimated to be about 11 percent.

Water yield increase was estimated using the ECA method for existing conditions in the project-area watersheds (Ager & Clifton, 2005). The ECA analysis estimated water yield increases due to insect mortality, roads, wildfires, and previous forest management actions, as compared to an undisturbed forest state. The analysis also evaluated the potential for water yield increases associated with the action alternatives evaluated for this report. The predicted water yield increases above baseline for the existing condition are within guidelines set by the Montana DEQ (ARM 17.30.715). This analysis suggested that under the current condition, water yield below the analysis area ranged from approximately three to six percent higher than if no trees in the basin were dead or removed in the past fifty years. The increased yield is due primarily to extensive insect-caused tree mortality in recent years. The estimated increase in water yield would be difficult to detect at the scale of a 6th-HUC drainage. Moreover, all of these drainages are over-appropriated for water withdrawals, and so any flow increase that remained in the channel (i.e. was not withdrawn at a diversion) would benefit aquatic and riparian habitat.

Table 183. Estimated equivalent clearcut acres and water yield increase – existing conditions.

6 th -HUC drainage	Watershed area (acres)	Total ECA (acres)	Beetle-kill ECA (acres)	Existing ECA (% of watershed)	Estimated water yield increase (%)
Lump Gulch	27,876	4,629	3,986	16.6	6
Last Chance Gulch	13,690	1,613	2,437	11.8	4
Middle Prickly Pear Creek	22,962	2,459	1,472	10.7	4
Upper Tennile Creek	26,130	3,177	2,935	12.2	4
Middle Tennile Creek	22,962	2,566	2,311	11.2	4
Lower Tennile Creek	20,411	1,732	1,597	8.5	3

Riparian Conditions

HLCNF watershed personnel surveyed proposed treatment units for wetlands, but no formal survey of wetland condition or extent was performed. Wetlands of various types

and sizes were observed throughout the project area. Non-riparian wetlands were generally observed to be in good condition within the project area. Riparian wetland conditions within the project area were more variable due to impacts from roads, livestock trampling, historic mining, and development.

Hydrology, Environmental Consequences

Introduction

Five measurement indicators were used evaluate each alternative's effects related to water resources:

- Sediment from roads (average tons per year)
- Sediment from treatment units (tons per year, 10% probability of occurrence)
- Equivalent clearcut area, a surrogate for water yield increase (acres)
- Miles of existing road (within 150 feet of a waterbody) decommissioned
- Acres of wetland restored vs. impacted by temporary roads

Effects Common to All Alternatives

There are no effects common to all alternatives.

Effects Common to All Action Alternatives

Road decommissioning mileage would be the same under both action alternatives (15 miles). Wetland restoration and road relocation along Beaver Creek are also proposed in both action alternatives. Project road maintenance and reconstruction are similar under both action alternatives, although road improvements are more extensive in alternative 2 than in alternative 3 (the project Transportation Report provides details on this work).

Alternative 1 – No Action

Direct and Indirect Effects

Under alternative 1, no new management actions are proposed. If no new actions are undertaken, no new management-related water resource impacts would occur. Past and ongoing management activities, such as road use, OHV use, mining, and livestock grazing would continue to affect water resources. No new additions to watershed-scale cumulative effects would be predicted because no new management activities are proposed with alternative 1. However, there are potential indirect effects associated with alternative 1. As is inferred in the fuels specialist report, the probability of large-scale wildfire with high-severity impacts in the project area, with its attendant watershed effects, would be higher in this alternative than in either action alternative.

Numerous studies have documented post-wildfire increases in erosion and stream sediment levels (e.g. Wagenbrenner et al., 2006; Spigel & Robichaud, 2007; Robichaud et al., 2008; Moody & Martin, 2009). While it is difficult to anticipate the exact pattern of burn severity to soils from either a prescribed fire or a wildfire in the project area, some general conclusions can be made from the fire-effects literature as well as monitoring of prescribed fire on the Helena NF (for details of HNF monitoring, see the project Soils

Specialist Report). Whereas a wildfire typically burns through a landscape when conditions are hot and dry, prescribed fires are usually implemented when soil, duff, and coarse woody debris moisture levels are relatively high (i.e. in the spring and late fall). Burning that occurs during conditions of higher soil moisture generally results in lower impacts to soils (Hartford & Frandsen, 1992; Stephan et al., 2012; Stoof et al., 2013). Stephan et al. (2012) found that wildfire-burned drainages exhibited higher-severity effects than drainages burned in springtime prescribed fires, and produced substantially greater impacts to water quality. Furthermore, Rhoades et al. (2011) found that post-fire impacts to water quality in and around the Denver municipal watershed were closely correlated to burn severity and extent—the larger the area with high-severity burn effects, the greater the impact to stream water quality during the five-year analysis period following the Hayman Fire in 2002.

Irreversible/Irretrievable Commitments

An irretrievable commitment represents a temporary loss of a resource which can be replaced over time. An irreversible commitment represents a total loss of a resource which cannot be replaced. Any water quality impacts due to the attendant watershed effects associated with increased wildfire risk in alternative 1 would be irretrievable commitments, in that soil and water quality would recover from the potential wildfire effects over a period of years. There are no irreversible commitments due to Alternative 1 because any potential impacts to water resources would be temporary in nature.

Cumulative Effects

The project area lies within a fire-prone landscape. Wildfires and associated watershed effects are likely under any of the alternatives. However, the project Fire and Fuels Specialist Report suggests that there would be an increased risk of wildfire with high-severity effects absent the management actions proposed under alternatives 2 or 3. Watershed effects from a wildfire could include loss of canopy cover and associated impacts to riparian function, short-term hydrophobicity, greatly increased soil erosion from burned hillslopes, water quality impacts including ash and sediment delivery to stream channels and stream temperature increases, and elevated water yield.

Water yield increases were estimated using the ECA method (Ager & Clifton, 2005) to account for all natural and human-caused loss of forest canopy, including tree mortality from the recent beetle epidemic. The existing ECA due to beetle epidemic, past harvest and wildfire was estimated to result in roughly a 3 to 6 percent increase in percent water yield increase under existing conditions in project-area 6th-HUC drainages. This analysis suggests that under the current condition, water yield in Tenmile Creek at the water treatment plant is 4 percent higher than if no large trees in the basin were killed or removed in the past sixty years. The estimated increase in water yield was due primarily to recent insect mortality. These increases likely would be undetectable at the 6th-HUC watershed scale.

There are no new management activities proposed under alternative 1, so aside from the potential increased risk of wildfire-related watershed effects, there are no additional cumulative effects related to alternative 1. Other past, present, and reasonably foreseeable activities that would continue to affect water quality, water yield, and riparian health and

vigor in the cumulative effects analysis area are discussed below under the alternative 2 cumulative effects section.

Alternative 2

Direct/Indirect Effects

Water Quality

Sediment from Roads

Alternative 2 proposes construction of 87 temporary road segments totaling about 43 miles (39 miles on FS lands and 4 miles on BLM lands), mostly on national forest system (NFS) land with a smaller proportion crossing private land. Proposed temporary road locations were reviewed in the field by watershed technicians. The review found that while most temporary road proposed locations are in upland areas that would not pose a risk of sediment delivery to streams, some are proposed to cross channels or wetlands (Table 184). Roughly two of the 43 miles of proposed temporary road would be within 150 feet of a stream channel. Potential short-term impacts of temporary roads crossing stream channels include temporary disruption of riparian habitat at the site of the crossing, as well as eroded fine sediment entering the stream channel and degrading aquatic habitat. Careful design and construction could limit sediment delivery in these locations, but would not prevent it entirely. Potential long-term impacts include opening access to unauthorized use and degradation of riparian conditions, although these impacts can be prevented through proper site restoration following project use. Potential sediment delivery was estimated by modeling a 100-foot approach with 12-foot width on each side of the stream at a 10 percent slope in native soil (Table 184). Temporary road crossings of wetlands would impact wetland habitat values and hydrologic function as long as the roads existed on the landscape, and likely for several years after the temporary roads were obliterated.

Executive Order 11990 limits the construction of roads within wetlands to those where no practicable alternative existed. Executive Order 11898 similarly limits the construction of roads within floodplains, but given their headwaters setting, none of the proposed temporary roads would cross what would be characterized as a floodplain. Temporary roads intended to cross a stream or wetland would require approval from the State of Montana with a SPA 124 permit and from the US Army Corps of Engineers with a CWA 404 permit.

Table 184. Proposed temporary road crossings of a stream or wetland, Alternative 2.

6 th -HUC drainage	Stream crossings			Wetland crossings	Estimated sediment delivery (tons/yr)
	Ephemeral	Intermittent	Perennial		
Lump Gulch	0	1	1	0	0.0
Last Chance Gulch	0	0	0	0	0.0
Middle Prickly Pear Creek	0	0	1	0	0.1
Upper Tenmile Creek	0	0	1	0	0.0
Middle Tenmile Creek	0	0	0	0	0.0
Lower Tenmile Creek	0	0	0	0	0.0

6 th -HUC drainage	Stream crossings			Wetland crossings	Estimated sediment
TOTAL	0	1	3	0	0.1

Alternative 2 includes roughly 32 miles of road reconstruction and 6 miles of road maintenance. Details of what each of these categories of road improvement would entail are described in the project Transportation Report. Road improvements would be done in accordance with the design criteria described in chapter 2 of this DEIS to improve drainage and reduce or eliminate sites that allow delivery of road sediment to a stream or wetland. The potential effects of the proposed road improvements were estimated using the WEPP:Road model. Table 185 summarizes the predicted reduction in sediment delivery to stream channels from project-related improvements to roads. Such improvements should be expected to last from roughly three to five years or more following treatment. This temporal variability is dependent on factors that affect sedimentation from roads and are difficult to predict, such as road use patterns, continued maintenance, and weather events.

Table 185. Estimated average annual sediment delivery from roads to streams in the project area.

6 th -HUC drainage	Average sediment delivery (tons/year)		Reduction from existing condition
	Existing	Alts 2 & 3	Alts 2 & 3
Lump Gulch	1.7	1.1	35%
Last Chance Gulch	3.7	1.4	62%
Upper Tenmile Creek	14.0	2.2	85%

As noted above, several culverts on haul routes in the project area are undersized or damaged and in need of replacement. In alternatives 2 and 3, these culverts would be replaced with pipes sized to pass at least the 25-year (4 percent occurrence probability) flood event (Table 186).

Table 186. Culverts to be replaced for the project, alternatives 2 and 3

HUC-6 drainage	Culverts upgraded
Lump Gulch	7
Last Chance Gulch	1
Upper Tenmile Creek	9

Sediment from Treatment Units

It is unlikely that alternative 2 would lead to increased streambank erosion (other than at temporary road locations, which were addressed above), as equipment would not operate in the SMZ or within 150 feet of Class 1 or Class 2 streams (see the design criteria section above in this report), and hand crews would not cut trees along stream banks. Hand crew work within the SMZ is not likely to result in a level of ground disturbance that would lead to any soil erosion or sediment transport.

Project activities are most likely to impact non-road sediment delivery to streams through burning in treatment units, and to a lesser extent, operation of equipment on hillslopes. To minimize sediment delivery from treatment units to streams, no-ignition buffers would be implemented. Buffer width was informed through WEPP erosion modeling. The regeneration treatment was modeled as “low severity burn” for treatment units with site preparation or broadcast burning. For units where jackpot burning or no burning was proposed, the treatment was modeled as 5-year forest, to reflect the more limited amount of burn disturbance (see the project Forested Vegetation Specialist Report for more information). No-ignition and no-mechanical-treatment buffers of 50 feet above streams are predicted to result in a negligible probability of sediment delivery to all treatment units in the project area.

Table 187 summarizes estimated 10 percent probability values of sediment delivery from treatment units by 6th-HUC watershed, predicted by the Disturbed WEPP model for the first year following treatment. The model suggests that there is a 90 percent probability that there would be less sediment movement to the bottom of treatment units than the values reported in the table. One unit (7c) in the Middle Tenmile Creek 6th-HUC drainage was predicted to have a 10 percent chance of delivering 7.87 tons of sediment to the base of the unit—the majority of the total project-wide. This is because a large proportion of the unit is mantled with glacial till, according to the HNF soil survey. This parent material is relatively high in clay, which limits infiltration during higher-intensity precipitation/snowmelt events, which can increase runoff and thus erosion. The glacial till is concentrated in the drainage bottoms wherever it occurs in the project area, and particularly in unit 7c. A 50-foot no-ignition/no-mechanical-treatment buffer substantially reduces model-predicted sediment delivery from this unit, but predicted only minor improvements in other units. Regardless, a minimum 50-foot no-ignition/no-mechanical buffer around ephemeral, intermittent, and perennial channels is recommended for all treatment units. Nonetheless, model-predicted probability of sedimentation from treatment units is slight, with the model predicting a 0 to 32 percent (depending on the unit) probability of a detectable (0.001 ton/acre) amount of sediment reaching the bottom of treatment units—the average probability project-wide was 4 percent. That is, the model predicted a 68 percent to 100 percent (average 96 percent) probability that no sediment would be delivered in the first year following treatment. Erosion and sediment delivery probability are expected to recover to pre-treatment rates within three to five years following implementation, based on observation and monitoring of burned areas across the HLCNF.

The values listed in Table 187 do not distinguish between units that are adjacent to or contain stream channels or wetlands and those that do not. Thus, these values are a conservative estimate of potential sediment delivery—many of these units are in upland settings and would not be expected to deliver sediment to any water body. These values assume that standard resource protection measures are properly and consistently applied by the contractor. Adequate oversight by the timber sale administrator and contracting officer is critical to achieving this standard.

Table 187. Predicted treatment unit sediment delivery rate (10% probability) with 50-foot buffer, first year following treatment.

6th-HUC drainage	Alt 2 Sediment delivery (tons)	Alt 3 Sediment delivery (tons)
Lump Gulch	0.1	0.0
Last Chance Gulch	0.1	0.1
Middle Prickly Pear Creek	0.0	0.0
Upper Tenmile Creek	0.4	0.1
Middle Tenmile Creek	0.9	0.1
Lower Tenmile Creek	0.1	0.1
TOTAL	1.6	0.3

Non-Sediment

Alternative 2 would be unlikely to influence stream temperature by removing streamside trees as such removal is expected to be minimal. Although the shade provided by dead, defoliated trees is substantially less than that provided by a living canopy, such trees still provide some shade to adjacent streams (Amaranthus et al. 1989). However, understory vegetation (including small trees) is generally unaffected by insect mortality. This vegetation would be preserved under alternative 2, and most trees within the streamside management zones would not be removed. Thus, this alternative would be unlikely to result in measureable increases in stream temperature.

Project activities under alternative 2 are unlikely to lead to an increase in metals contamination in project area streams or wetlands, as equipment and burning operations would not occur on known or newly discovered contaminated areas (see project Minerals Report for more information on this topic).

Road Decommissioning

Alternative 2 would include the decommissioning of roughly 15 miles of road. Approximately 1.8 miles of this total on 8 separate road segments are within 150 feet of a stream channel. Due to their proximity to streams, these road segments have a higher probability of being a chronic source of sediment. Roads would be treated to de-compact surfaces, re-establish natural hillslope contours and vegetation cover, and discourage unauthorized use by motorized vehicles. This work would restore soil productivity and reduce potential erosion on roughly 75 acres of land in the project area. Although sediment delivery to streams was not quantified for this analysis, the decommissioning would likely reduce the amount of anthropogenic sediment load to project-area streams.

Water Yield

The project-related and cumulative equivalent clear-cut acres and estimated percent water yield increase that would result from work proposed under this alternative are listed in Table 188.

Although most timber volume to be cut in the project area is dead, some green trees would be removed, particularly in the pre-commercial thin units. The project-related and

cumulative equivalent clear-cut acres and estimated percent water yield increase that would result from work proposed under this alternative are listed in Table 188. Estimated ECA increases per 6th-HUC watershed range from 0 to 4 percent of drainage area under alternative 2. Estimated existing water yield increase above what would be expected in undisturbed forest canopy as a result of recent insect mortality ranges from 3 to 6 percent. Cumulative ECA was estimated to be about 13 percent of Tennile Creek below the project area or 2 percent above existing conditions. The estimated water yield increases for each 6th-HUC drainage and Tennile Creek below the project area are below the 15 percent threshold stipulated in ARM 17.30.715. Therefore, the small incremental potential increase posed by this project would likely not measurably change conditions. However, if a water yield increase were detectable, it would almost certainly be within acceptable limits for TMDL streams. Moreover, water from all of the mainstem streams in the project area is heavily appropriated for out-of-channel uses, especially during low-flow periods. Any increase in baseflow in these streams would likely have beneficial effects.

Table 188. Estimated equivalent clearcut acres and water yield increase – alternative 2.

6 th -HUC drainage	Alt 2 ECA	Cumulative ECA	Project water yield increase (%)	Cumulative water yield increase (%)
Lump Gulch	489	5,118	1	6
Middle Prickly Pear Creek	36	2,495	0	4
Last Chance Gulch	293	1,906	1	4
Upper Tennile Creek	1,129	4,306	2	4
Middle Tennile Creek	163	2,729	0	4
Lower Tennile Creek	33	1,765	0	3

Riparian and Wetland Areas

A total of 87 wetlands were identified on NFS land at least partially within alternative 2 treatment units during the HNF survey in 2014. The wetlands vary in size from under 1000 square feet to several acres in size. Settings range from high-elevation, poorly drained, low-gradient meadows and woodlands in the Tennile Creek headwaters to small slope-transitional seeps in drier pine foothills in the south Helena area. All of these sites are sensitive to disturbance and should not be impaired in any way by project activities. Design criteria that would apply for activities in or near wetlands are described in the project Soils Specialist Report. Generally, no trees would be removed from wetlands, and no equipment would traverse a wetland unless under winter operating conditions as defined in the Soils Specialist Report.

Temporary road segments would cross roughly 4 wetlands or riparian areas in alternative 2. This information was discussed above under the sediment from roads section. In addition to the risk of sedimentation, roads crossing wetlands reduce the area of wetland habitat and impair wetland function. However, temporary roads would be

decommissioned immediately following use, and could expect to return to pre-project conditions over time.

Table 189. Treatment units identified with wetland acreage – alternative 2.

6th-HUC drainage	Units containing wetlands	
	Alt 2	Alt 3
Lump Gulch	11	4
Last Chance Gulch	0	0
Middle Prickly Pear Creek	0	0
Upper Tenmile Creek	26	17
Middle Tenmile Creek	1	1
Lower Tenmile Creek	0	0

In both action alternatives, the wetland at T 9N R5W Section 34 above (north of) the road along Beaver Creek would be restored and road 299 in that vicinity improved to allow surface and groundwater to pass without impacting the road surface. The palustrine forested wetland was partially drained with a ditch at some point in the past—likely in order to improve conditions for travel along the road in that location. The project would include filling the ditch to restore the historic water elevation, installing appropriate drainage under the roadway, and raising the road surface elevation to improve the running surface and reduce maintenance requirements. Restoration of the historic water elevation in this area would allow the wetland to expand back to its original area—roughly 24 acres, or more than double its current area.

Additionally, the segment of road 299 in the vicinity of the above-described wetland would be relocated roughly 300 feet upslope in order to restore the wet area where the road currently crosses, improve road surface conditions, and reduce maintenance needs. In its current configuration, the road is frequently wet, rutted, and in generally poor condition. Relocating this segment of road to a drier hillslope above would allow the restoration of roughly five acres of wet meadow habitat.

Alternative 2 would impact the hydrologic function of riparian areas where new temporary stream-crossing roads are proposed. Beyond these sites, no mechanical equipment would operate in riparian areas, and hand-felling in the SMZ would be minimized. All project activities would be performed in accordance with state regulations, including Montana's SMZ law and RHCA restrictions described in the project Aquatic Species Specialist Report.

Irreversible/Irretrievable Commitments

Any water quality impacts due to increased sediment delivery resulting from Alternative 2 would be irretrievable commitments, in that the stream would recover from the influx of additional sediment over a period of years. There are no irreversible commitments due to alternative 2 because any potential impacts to water resources stemming from project activities would be temporary in nature and counterbalanced by watershed improvements as discussed in this report.

Cumulative Effects

Several past and present federal and non-federal activities have affected and continue to affect water quality, water yield, and riparian conditions in the cumulative effects analysis area. Appendix B of the Hydrology Report includes tables of past, present, and future activities that could contribute to water-resources potential cumulative effects.

Federal and private roads and culverts constructed at road/stream crossings in the project area have impacted streams and riparian areas. There are several sediment delivery points on existing roads as described previously, and culverts represent a permanent grade control in the stream channels where they have been constructed. Culverts directly interact with channels and can affect channel morphology and channel migration patterns, and also local hydraulics that may impact the stream channel.

Grazing in riparian areas and cattle trailing along streams within grazing allotments would likely continue to contribute elevated sediment levels to streams in the project area. In the absence of other reductions to sediment delivery, streams in several of the watersheds where treatment is planned would continue to receive elevated levels of sediment due to impacts from cattle grazing. Alternative 2 could affect livestock management activities and related impacts in the project area by opening up currently timbered areas to enhanced forage production and easier movement by cattle. The impact of this potential effect is difficult to predict. Impacts to streams could increase as cattle are able to use previously inaccessible areas. Conversely, livestock impacts to streams could lessen as improved forage and access in upland locations eases pressure in riparian areas. The effect of the project on livestock use patterns should be monitored, and appropriate adjustments made if stream and wetland habitats are negatively impacted.

In the past, mining has contributed metals and sediment to stream channels in the watersheds. There are no large-scale active mines in the project area. However, abandoned mines can pose chronic or episodic water quality problems to forest streams. There are numerous draining adits and contaminated waste rock dumps in the upper Tenmile drainage, many of which are in the process of remediation under the Upper Tenmile CERCLA effort. In order to avoid exacerbating runoff from existing abandoned mine lands, deposits (e.g., waste rock and tailings) would not be disturbed during project operations.

In the Tenmile – South Helena project-area watersheds, water yield has been and most likely would continue to be affected by large-scale tree mortality due to insect infestations. Large-scale loss of live trees reduces the volume of water removed from a watershed by transpiration. Increases in water yield could result in higher peak flows in high-probability peak flow events. Activities proposed under alternative 2 are not predicted to have any measureable effect on water yield.

Extensive tree mortality could also impact stream temperature in streams that cross the affected stands. However, understory vegetation, generally unaffected by insect mortality, would continue to provide shade. Furthermore, understory and riparian vegetation exposed to increased levels of sunlight and moisture (due to overstory mortality or tree removal) can expand and provide additional shade (Gravelle & Link, 2007). While an increase in incoming short-wave (solar) radiation is generally considered

to be the dominant driver of stream temperature increase, numerous factors influence the extent to which a stream exposed to additional direct sunlight would have an increase in water temperature (Johnson 2004). Thus, the extent of water temperature changes resulting from overstory mortality is difficult to predict. Alternative 2 would be unlikely to contribute to any meaningful stream temperature increase, given the minimal removal of vegetation in SMZs and RHCAs.

Other timber harvest operations have the potential to result in increased sediment loading to project-area streams. Recent and ongoing timber harvest includes work on private inholdings within the upper Tenmile Creek and Last Chance Gulch drainages as well as recent roadside Hazard tree removal work on Forest Service roads. Analysis presented above suggests that the proposed project would include improvements and mitigations that would lead to a net reduction in anthropogenic sediment loading to project-area streams.

Alternative 3

Key differences between alternatives 2 and 3 include the following:

- Alternative 3 would treat fewer units and fewer acres.
- Fewer wetland acres are located within alternative 3 treatment units.
- Alternative 3 would require construction of fewer miles of temporary roads.

Direct/Indirect Effects

Discussion of direct and indirect effects of alternative 3 is abbreviated to avoid duplication—for additional details, see discussion in the appropriate section of alternative 2 above.

Water Quality

Sediment from Roads

Alternative 3 proposes construction of 40 temporary road segments totaling about 21.8 miles. A review of proposed temporary road locations found that while most temporary road proposed locations are in upland areas that would not pose a risk of sediment delivery to streams, some are proposed to cross channels or wetlands (Table 190). Roughly one mile of the 21.8 miles of proposed temporary road would be within 150 feet of a stream channel. Potential short-term impacts of temporary roads crossing stream channels include temporary disruption of riparian habitat at the site of the crossing, as well as eroded fine sediment entering the stream channel and degrading aquatic habitat. Careful design and construction could limit sediment delivery in these locations, but would not prevent it entirely. Potential long-term impacts include opening access to unauthorized use and degradation of riparian conditions, although these impacts can be prevented through proper site restoration following project use. Potential sediment delivery was estimated by modeling a 100-foot approach with 12-foot width on each side of the stream at a 10% slope in native soil (Table 190). Temporary road crossings of wetlands would impact wetland habitat values and hydrologic function as long as the roads existed on the landscape, and likely for several years after the temporary roads were obliterated.

Executive Order 11990 limits the construction of roads within wetlands to those where no practicable alternative existed. Executive Order 11898 similarly limits the construction of roads within floodplains, but given their headwaters setting, none of the proposed temporary roads would cross what would be characterized as a floodplain. Temporary roads intended to cross a stream or wetland would require approval from the State of Montana with a SPA 124 permit and from the US Army Corps of Engineers with a CWA 404 permit.

Predicted sediment delivery reductions from roads due to maintenance and reconstruction efforts would be the same under alternatives 2 and 3 (Table 185).

Table 190. Proposed temporary road crossings of a stream or wetland, alternative 3.

6 th -HUC drainage	Stream crossings			Wetland crossings	Estimated sediment delivery (tons/yr)
	Ephemeral	Intermittent	Perennial		
Lump Gulch	0	1	1	0	0.0
Last Chance Gulch	0	0	0	0	0.0
Middle Prickly Pear Creek	0	0	0	0	0.0
Upper Tenmile Creek	0	2	0	1	0.2
Middle Tenmile Creek	0	0	0	0	0.0
Lower Tenmile Creek	0	0	0	0	0.0
TOTAL	0	3	1	1	0.2

Sediment from Treatment Units

As with alternative 2, erosion and sediment transport from treatment units is predicted to be negligible assuming that 50-foot no-ignition buffers and other standard soil and water BMPs are appropriately implemented (Table 184). Refer to the discussion under the alternative 2 section above for additional detail.

Non-Sediment

For the same reasons that are outlined in the discussion of alternative 2, project activities proposed in alternative 3 would be unlikely to result in measurable increases in stream temperature or in-stream heavy metals. Refer to the discussion under the alternative 2 section above for additional detail.

Road Decommissioning

As in alternative 2, alternative 3 would include the decommissioning of roughly 15 miles of road. Refer to the discussion under the alternative 2 section above for additional detail.

Water Yield

Although most timber to be cut in the project area is dead, some green trees would be removed, particularly in the pre-commercial thin units. The project-related and cumulative equivalent clear-cut acres and estimated percent water yield increase that would result from work proposed under this alternative are listed in Table 191. Estimated ECA increases per 6th-HUC watershed range from 0 to 4 percent under alternative 3. Estimated existing water yield increase above what would be expected in undisturbed

forest canopy as a result of recent insect mortality ranges from 3 to 6 percent. Cumulative ECA was estimated to be about 12 percent of Tennile Creek below the project area or 1 percent above existing conditions. The estimated water yield increase for each 6th-HUC and Tennile Creek below the project area is below the 15 percent threshold stipulated in ARM 17.30.715. Therefore, the small incremental potential increase posed by this project would likely not measurably change conditions. However, if a water yield increase were detectable, it would almost certainly be within acceptable limits for TMDL streams. Moreover, water from all of the mainstem streams in the project area is heavily appropriated for out-of-channel uses, especially during low-flow periods. Any increase in baseflow in these streams would likely have beneficial effects.

Table 191. Estimated equivalent clearcut acres and water yield increase – alternative 3

6 th -HUC drainage	Alt 3 ECA	Cumulative ECA	Project water yield increase (%)	Cumulative water yield increase (%)
Lump Gulch	246	4,875	0	6
Middle Prickly Pear Creek	0	2,459	0	4
Last Chance Gulch	288	1,901	1	5
Upper Tennile Creek	962	4,139	1	6
Middle Tennile Creek	101	2,667	0	4
Lower Tennile Creek	29	1,761	0	3

Riparian and Wetland Areas

Approximately 40 wetlands were identified in alternative 3 treatment units on NFS land during the HNF survey in 2014. The wetlands vary in size from under 1000 square feet to several acres in size. Settings range from high-elevation, poorly drained, low-gradient meadows and woodlands in the Tennile Creek headwaters to small slope-transitional seeps in drier pine foothills in the south Helena area. All of these sites are sensitive to disturbance and should not be impaired in any way by project activities. Design criteria that would apply for activities in or near wetlands are described in the project Soils Specialist Report. Generally, no trees would be removed from wetlands, and no equipment would traverse a wetland unless under winter operating conditions as defined in the Soils Specialist Report.

Temporary road segments would cross roughly 5 wetlands or stream riparian areas in alternative 3. This information was discussed above under the sediment from roads section. In addition to the risk of sedimentation, roads crossing wetlands reduce the area of wetland habitat and impair wetland function. However, temporary roads would be decommissioned immediately following use, and could expect to return to pre-project conditions over time.

In both action alternatives, the wetland at T 9N R 5W Section 34 above (north of) the road along Beaver Creek would be restored and road 299 in that vicinity improved to

allow surface and groundwater to pass without impacting the road surface. This work is described above under the alternative 2 effects section.

Alternative 3 would impact the hydrologic function of riparian areas where new temporary stream-crossing roads are proposed. Beyond these sites, no mechanical equipment would operate in riparian areas, and hand-felling in the SMZ would be minimized. All project activities would be performed in accordance with state regulations, including Montana's SMZ law and RHCA restrictions described in the project Aquatic Species Specialist Report.

Irreversible/Irretrievable Commitments

Any water quality impacts due to increased sediment delivery resulting from alternative 3 would be irretrievable commitments, in that the stream would recover from the influx of additional sediment over a period of years. There are no irreversible commitments due to alternative 3 because any potential impacts to water resources stemming from project activities would be temporary in nature and counterbalanced by watershed improvements as discussed in this report.

Cumulative Effects

The cumulative effects related to ongoing grazing, beetle epidemic, existing roads, culverts, abandoned mines, and federal and private forest management activities described under alternative 2 would also apply to alternative 3 (see Section 8.4.3 for a complete discussion of past and ongoing activities).

Alternatives 2 and 3 would not likely add to cumulative effects to water resources in the project area for the following reasons:

- Both alternatives would include road maintenance and decommissioning that would result in a net reduction in sediment delivery to project-area streams.
- No-ignition buffers and adherence to SMZ provisions would limit the potential for sediment delivery to streams from unit treatments.
- The effects of opening large upland areas to increased forage production and livestock movement are uncertain and difficult to predict. Repaired fences that no longer are breached by falling trees would improve the effectiveness of livestock management in project-area grazing allotments.
- Mining deposits (e.g., waste rock and tailings) would not be disturbed during project operations.
- Activities proposed under both alternatives would have a minimal effect on water yield.
- Both alternatives would be unlikely to meaningfully contribute to any stream temperature increase given the minimal removal of vegetation in SMZs.

Conclusions

The proposed project would treat approximately 24,308 acres (alternative 2, proposed action) to 18,112 acres (alternative 3) with a combination of regeneration, intermediate treatment, and intermediate harvest (see Telegraph Project Forested Vegetation Specialist

Report). Table 192 summarizes the effects of alternatives on water-related resources using four measurement indicators.

Table 192. Comparison of water resource measurement indicators by alternative

6th-HUC drainage	Alternative 1 (Existing Condition)	Alternative 2	Alternative 3
Water Quantity Cumulative Effects (equivalent clearcut area within Forest Boundary)			
Lump Gulch	4,629	5,118	4,875
Middle Prickly Pear Creek	2,459	2,494	2,459
Last Chance Gulch	1,613	1,906	1,901
Upper Tenmile Creek	3,177	4,306	4,139
Middle Tenmile Creek	2,566	2,729	2,667
Lower Tenmile Creek	1,732	1,765	1,761
Sedimentation from treatment units (tons, probability of sedimentation in the first year after treatment)			
Lump Gulch	N/A	0.1	0.0
Middle Prickly Pear Creek	N/A	0.0	0.0
Last Chance Gulch	N/A	0.1	0.1
Upper Tenmile Creek	N/A	0.4	0.1
Middle Tenmile Creek	N/A	0.9	0.1
Lower Tenmile Creek	N/A	0.1	0.1
Sedimentation from Roads (average tons/year)			
Lump Gulch	1.7	1.1	1.1
Middle Prickly Pear Creek	--	--	--
Last Chance Gulch	3.7	1.4	1.4
Upper Tenmile Creek	14.0	2.2	2.2
Middle Tenmile Creek	--	--	--
Lower Tenmile Creek	--	--	--
Road decommissioning (miles decommissioned within 150 feet of stream)			
Lump Gulch	0	0.1	0.1
Middle Prickly Pear Creek	0	0	0
Last Chance Gulch	0	0	0

6 th -HUC drainage	Alternative 1 (Existing Condition)	Alternative 2	Alternative 3
Upper Tenmile Creek	0	1.8	1.8
Middle Tenmile Creek	0	0	0
Lower Tenmile Creek	0	0	0
Wetlands restored/impacted (acres restored minus acres impacted by temporary roads)			
Upper Tenmile Creek	0	17.0	16.5

Alternative 1 – No Action

Currently, several of the streams in the project area watersheds are listed on Montana's CWA 303(d) list as being impaired, primarily due to metals contamination from abandoned mine lands and sediment/siltation from a variety of sources, including forest roads.

The project area is a fire-prone landscape. Therefore wildfire and attendant watershed effects are likely under any of the alternatives. However, the Tenmile – South Helena Project Fuels Specialist Report suggests that there would be an increased risk of wildfire absent the management actions proposed under alternatives 2 or 3. Watershed effects from a wildfire could include increased water yield, sediment delivery to stream channels, streambank erosion and damage to riparian health and vigor, short-term hydrophobicity, and long-term streamflow increases and sedimentation.

Since there are no activities proposed under alternative 1, there are no cumulative effects related to alternative 1.

Alternative 2

Alternative 2 would be consistent with applicable state and federal laws and regulations, if proposed activities are done in accordance with reasonable land, soil, and water conservation practices as summarized in this report and applicable design criteria from the project's Aquatic Species Specialist Report and the Soils Specialist Report.

Proposed activities under alternative 2 are predicted to result in a net decrease in sediment delivery to streams over the next 3-7 years, based on a low probability of delivery from treatment units and reductions in chronic sediment load from project road improvements. Furthermore, culvert upgrades would reduce the likelihood of failure and sediment entrainment during flood events, as well as improve aquatic organism passage for the affected streams. Over the long-term, improved road surfaces would likely revert to current conditions with associated sediment delivery unless improvements are maintained.

Rigorous application of existing road maintenance, construction, decommissioning, hauling, and timber harvest BMPs would meet the state requirement that "all reasonable land, soil and water conservation practices have been applied" to minimize pollution in the watersheds covered by the alternative 2 (ARM 17.30.602).

Proposed activities under alternative 2 would comply with the Montana SMZ law by adhering to applicable design criteria. The project and analysis complies with applicable Forest Plan standards. Existing impairments to water bodies due to ongoing timber harvest activities on private land, abandoned mine lands, and past federal actions would be unaffected by activities proposed under alternative 2. The analysis of environmental consequences and conclusions documented in this report assume that the design criteria and mitigation measures would be applied effectively in all project activities. Refer to the project Soils Specialist Report and the Aquatic Species Specialist Report for additional design criteria and mitigation measures.

Implementation of alternative 2 would have a net benefit to project area water resources over the next 3 to 7 years, based primarily on the improvements planned to roads in the project area, the low probability of sedimentation from treatment units, and minimal disturbance of existing wetlands and riparian areas. Proposed restoration of wetlands and culvert upgrades would have a long term (beyond 7 years) benefit to water resource values. A less tangible potential benefit would be the reduction in probability of a widespread wildfire with high-severity watershed effects, and the reduction in probability of fire spread from the Telegraph Creek drainage to the adjacent Upper Tenmile Creek (Helena municipal watershed) drainage.

Alternative 3

All of the conclusions drawn for alternative 2 apply to alternative 3, as all of the watershed-benefiting activities in the proposed work (road improvements and decommissioning, culvert upgrades, wetland restoration) are the same for both action alternatives. Alternative 3 proposes fewer temporary road crossings of perennial streams, but has one proposed wetland crossing, which alternative 2 lacks. The potential impacts to water resources of alternative 3 from treatment units were predicted to be lower than those of alternative 2 in that sediment modeling predicted somewhat lower sediment delivery to streams from treatment units assuming effective implementation of design features such as no-ignition buffers.

Monitoring

To ensure compliance with local, state, and federal water quality standards, the HNF Forest Plan requires annual monitoring of “10 percent of timber sales or other projects that create soil disturbance” (USDA, 1986, p IV/15). If the Telegraph Vegetation project is implemented, areas within the project area would be monitored to determine the effectiveness of treatment-unit and road BMPs. Monitoring of BMPs, during and after project work, would be critical in determining whether applied measures are effective in minimizing sediment delivery to streams. The road improvement contracting officer's representative (COR) and timber sale administrator would monitor BMPs for proper implementation and effectiveness, and watershed staff would evaluate their effectiveness. Monitoring that would likely occur includes review of harvest and burn units adjacent to waterbodies to ensure any SMZ law and RHCA prescription guidelines were followed, and to identify any erosion and sediment delivery to streams. Additional monitoring could include assessment of road conditions to determine effectiveness of road BMPs in reducing sediment delivery to streams. Where BMPs are shown to be inadequate in

protecting water quality, they would be modified or project activities would be discontinued.

To ensure compliance with local, state, and federal water quality standards, the Approved Butte Resource Management Plan states that “water quality will be monitored to establish baseline conditions, identify areas of concern, and document progress from mitigation measures” (DOI, 2009, p 64). If the Tenmile-South Helena project is implemented, water quality and riparian areas would be assessed prior to activities occurring on BLM managed public lands to determine baseline conditions. Areas would also be monitored during activities and after completion to determine if applied BMPs were effective at minimizing sediment delivery to streams or impacts to riparian/wetland areas.

Forest Plan Consistency

All alternatives would be consistent with the general and municipal watershed provisions in the HNF Forest Plan (USDA FS, 1986). Specifically,

- The project is consistent with management area standards and guidelines (USDA FS, 1986 p II/24),
- Pertinent soil and water best management practices (BMPs) or resource protection measures listed in the Forest Service National Core BMP Technical Guide (USDA FS, 2012)) would be implemented (USDA FS, 1986 p II/25),
- Project implementation and post-implementation effects would be monitored to ensure that BMPs are implemented properly and are effective (USDA FS, 1986 p II/25).

Appendix B of the DEIS summarizes the Forest-wide and regional standards that are applicable to water resources, and explains how each standard is being met by the project and by the analyses in this report.

Fisheries

Introduction

Goals of the Tenmile – South Helena project are to improve conditions for public and firefighter safety across the landscape in the event of a wildfire and to maintain consistent quantity and quality of water, improved water quality, watershed function, and other resource values within the municipal watershed. In order to achieve these purposes, there is a need to create a mosaic of vegetation and fuel structure more resilient to disturbance which would provide for safer, more effective fire suppression actions. The project proposal includes prescribed fire, vegetative harvest, thinning, as well as wetland and native fish restoration. The project boundary encompasses seven 6th field HUCs (Hydrologic Unit Codes): Lump Gulch, Middle Prickly Pear, Last Chance Gulch, Upper, Middle, and Lower Tenmile Creek, all of which are east of the continental divide, and a small portion of Mike Renig Gulch, located west of the Continental Divide. The fisheries report focuses on the 6th Code HUCs where fisheries resources are known to exist in the project area, Lump Gulch and Upper Tenmile Creek. Only treatment units and roads that

present a sediment delivery risk to streams with fish populations and habitat were analyzed.

Native fishes historically known to occupy streams within the planning area include sensitive westslope cutthroat trout. However, westslope cutthroat trout are not known to be present in any streams in the project area. Brook trout, on the other hand, currently occupy 28.3 miles of stream in three of the 6th field HUC watersheds in the analysis area and are the most widely distributed fish species in the project area. Rainbow trout are also known to occupy the mainstem of Tennmile Creek in the Upper Tennmile Creek subwatershed in the project area.

The physical presence of high-risk roads (defined as those within approximately 150-300 feet of a stream capable of sediment delivery to the watercourse) can have an adverse effect on aquatic resources. Both action alternatives propose a total of 15 miles of road decommissioning; 3.2 miles of the roads proposed for decommissioning lie within 300 feet of streams. In addition, the action alternatives propose the decommissioning of six stream crossings and restoration of the stream channel in these locations. Alternative 2 proposes three temporary stream crossings resulting in no estimated increase of sediment delivery in fish bearing subwatersheds while alternative 3 proposes five stream and wetland crossings and 0.2 tons per year. Alternative 2 proposes more miles of haul routes and temporary roads than alternative 3, but actually has fewer miles of high-risk haul routes near streams. Consequently, under Alternative 2 there would be fewer high risk road reaches in riparian areas exposed to truck traffic associated with the project, even though the additional acres of vegetation treatment may result in more traffic on the haul roads than if alternative 3 was implemented. While alternative 3 may have more miles of high risk haul routes within 150-300 feet of streams, it also would implement the most miles of road maintenance and reconstruction and BMPs that would reduce effects to streams in the project and cumulative effects areas. Both action alternatives are anticipated to result in benefits that reduce sediment delivery and over the long term would maintain or improve the percent fines in spawning habitat in fish bearing streams in the project and cumulative effects area.

Partial or complete barriers to aquatic organisms have been identified and will be considered for replacement in the Lump Gulch subwatershed. Refer to the Tennmile – South Helena Hydrology report for identified barriers and sediment delivery points associated with high risk culverts.

Both action alternatives also provide for wetland restoration and the establishment of westslope cutthroat trout populations in reaches of Moose and Minnehaha creeks in the Upper Tennmile Creek subwatershed where no native trout are currently present.

Resource Indicators and Measures

Project design has minimized or eliminated potential impacts to some resources, including fisheries and aquatic species habitat such as large wood recruitment and stream temperature, habitat complexity and stability, and spawning gravel sedimentation. Other parameters that could affect aquatic habitat and species are evaluated in the hydrology specialist report (i.e. fine sediment delivery from roads and treatment units to stream

channels, and water yield). This report will discuss these parameters, and will also address the following as aquatic habitat/species resource indicators:

- Partial or complete barriers to aquatic organism passage (AOP)—number of AOP barriers identified in the project area
- Number of high risk culverts
- Maintenance or reconstruction of roads within 150 and 300 feet of a stream (high risk roads).

Assumptions

- Past and ongoing land-use activities have had varying cumulative levels of negative and positive effects on fish habitat and fish populations for nearly all fishery streams throughout the analysis area.
- Effects to fish habitat associated with the decisions made via this fuels reduction project have the potential to affect fisheries habitat primarily through sediment delivery to streams and affect the quality of spawning and rearing habitats for fish.
- Baseline conditions are a function of all past and ongoing activities.
- Road Sediment mitigation will be prioritized based on the level of use proposed, the value of the fishery for salmonids, and whether it is a TMDL sediment-impaired stream.
- Some sediment control improvements have the potential for short term sediment increases while being implemented due to ground disturbance that occurs as part of the maintenance activity.
- Estimates of relative sediment yields from both natural and management-induced sources are “reasonably” accurate following procedures of the U.S.D.A Agricultural Research Service’s Water Erosion Prediction Project (WEPP) model.
- Sediment delivery and deposition in stream channels is an important source of mortality to both trout and freshwater mussels. Other potential sources of mortality to trout such as temperature, dissolved oxygen, lack of food or cover, and angler harvest are assumed to be unaffected by the project since soil conservation and watershed Best Management Practices, Streamside Management Zone rules and regulations, resource protection measures, and no-ignition buffers would be implemented to protect surface water quality and fisheries habitat.
- As long as sediment inputs to streams exceed the transport capacities, impacts to aquatic habitat are cumulative.
- The response of trout populations to increased inputs of fine sediment defined at sediment less than 6.4 mm (0.25 inches) diameter in spawning and rearing habitat as depicted in laboratory studies approximates the response under natural conditions.
- Research demonstrates an inverse relationship exists between the amount of fine sediments (less than 6.4 mm or 0.25 inches) in spawning and rearing habitats and fish embryo survival and fry emergence.

- Average fine sediments (less than 6.4 mm or .25 inches), including 67 percent (one standard deviation each side of the mean) of the overall range, found in spawning habitat of streams under natural (reference) conditions is a reasonable measure of natural variation as an objective for managing toward desired conditions in fish habitat.
- Critical stream reaches (core sampling reaches) are representative of spawning habitat within each watershed for estimating potential effects on fish habitat.
- Culvert crossing failure is assumed to remove the entire fill volume, and an approximation of this value is useful to assess the erosional consequences as an ongoing risk tied to culvert crossings.
- Localized fish populations in the project area are characterized as having low adult spawning escapement. Fish populations defined by low adult spawning escapement (under-seeded habitat) are regulated at the spawning/reproductive phase of their life history.
- It is assumed that the ignition zone buffers recommended from the hydrology analysis in conjunction with SMZ compliance would minimize sediment generated in treatment units from reaching streams.

Information Used

Data addressing the two major elements of the fisheries resource that could be affected by the project have been collected and include 1) fish populations occupying affected drainages, and 2) stream habitat conditions with a focus on fine sediment levels in spawning substrates. Information on the status of fish populations and habitat in the planning area was drawn primarily from field data collected by both FS and Montana Department of Fish Wildlife and Parks (MDFWP) fisheries crews starting in the early 1990s with the latest information obtained during the summer 2014. Additional information was obtained from Garcia and Associates (2004) and Skarr and McGuire (2006).

The fish population information obtained helps define the existing status (baseline) of salmonid populations; data utilized includes that collected as part of ongoing fishery inventory surveys, that from past project reports and that specifically collected to assess this project. The Forest Service is charged with maintaining the viability of all existing native and desired non-native vertebrate species in a planning area (36 CFR 219.20). This information is essential to qualitatively assess relative viability risk for fish populations, especially regarding sensitive westslope cutthroat trout (WCT), the fish management indicator species for the Forest. Two or three-person fisheries crews using standard backpack electrofishing equipment collected data on fish species present, relative abundance levels (densities) or population estimates, and distribution of fish throughout the sub-watersheds. Characterizing local fish populations is important for a qualitative risk assessment of population viability potentially affected by exposure to additional fine sediment potentially transported to Tenmile Creek from treatment units.

Information about fish habitat to help estimate baseline conditions specific to percent fine sediment levels, that less than 6.4 mm (0.25 inches), in salmonid spawning habitat has been collected in Tenmile Minnehaha, and Walker creeks in the Tenmile drainage, Mike

Renig Gulch west of the Continental Divide outside the project area, Lump Gulch and Buffalo Creek in the Lump Gulch 6th field Hydrologic Unit Code (HUC) watershed to help assess baseline conditions from which to compare possible habitat quality changes brought about by project activities associated with each action alternative. This report relies on past core sampling data obtained from spawning habitat in streams in the project area. Based on sampling design, the fish bearing streams within a 6th-code HUC which have core sampling available are assumed to be representative reaches for the HUC. Additional sediment samples were collected in 2014 in Tennmile Creek; and will be used in future comparisons. Changes in habitat, including parameters such as substrate quality, can affect changes in fish population productivity and viability (MacDonald et al. 1991, pg 152). Specific to this project, core sampling data to determine fines (less than 6.4 mm) by depth in spawning substrates in fish-bearing streams is a key analysis indicator since vegetative treatments and modifications to the transportation system compose the greatest potential impact to salmonid salmon habitat through alteration of the of sediment production rates in the drainages (MacDonald et al. 1991, pg 125).

Excessive sediment production beyond natural background levels is a serious issue for fisheries management. Consequently, an inventory of road sediment sources was completed in the planning area to gain knowledge about the magnitude and locations of hydrologically connected road segments (chronic sources of excessive sediment). Forest roads also frequently cross streams using culverts commonly under-designed to pass flood flows and provide for fish passage. Culvert crossings can cause both chronic sedimentation impacts during typical water years and catastrophic effects when floods trigger crossing failure (USDA-FS 1998, pg 2). To address this, hydrology/fish crews inventoried and assessed culverts throughout the planning area to help assess flood risks and sediment potential at sites important for fisheries and watershed management.

Additional information about various land-use activities was obtained from sources within the Helena National Forest to help frame the cumulative effects analysis. Additional information about land-use disturbance was gathered by fisheries and hydrology personnel. This information is essential to help determine what and where other sources of risk to fisheries are occurring for inputs into planning and cumulative effects analyses.

Methodology

Analysis Scale

The scale of analysis is at the sub-watershed unit, also known as 6th-field HUC drainage. This is an appropriate scale to analyze differences in sediment yields and potential effects to aquatic wildlife populations. Analysis at the watershed or fifth-HUC drainage scale could miss smaller-scale effects that could occur due to forest management activities.

The temporal bounding of the analysis for direct and indirect effects ranges from one to five years. Short-term increases in sediment delivery associated with construction and obliteration activities would last as long as soil is disturbed or exposed. Once it has been stabilized with aggregate or vegetation has re-established after decommissioning, construction-related impacts would not be expected to persist with a temporal scale of a few months to one year. For management activities on treatment units, the potential for

sediment delivery is highest in the first year following disturbance and generally recovers to pre-disturbance conditions within five years. Therefore, discussions of direct and indirect effects related to treatment units have a temporal scale of five years. The temporal scale for the cumulative effects analysis is greater than five years.

Methodologies

This report ties closely to the watershed analysis in the hydrology specialist report and relies on the same models used for predicting sediment delivery from roads and proposed treatment units that can affect fish habitat. For detailed information on sediment analysis, refer to the Tennile – South Helena Hydrology Specialist Report.

Integration of the watershed analysis sediment yield to streams and its effect on trout spawning habitat is required to determine the relative risk to fisheries resources. A qualitative method was utilized to assess whether projected sediment delivery was expected to be above current levels in Tennile Creek and Lump Gulch drainages. Previous analyses of other projects showed no perceivable change in percent fines by depth in spawning habitat or the degree of sediment change was discountable where sediment yield less than a ton was produced.

Critical reaches most representative of spawning habitat and responsive to changing sediment yields were selected for sampling using the McNeil Core sampling procedures described by Platts et al. (1983, pgs -19) and Bunte and Abt (2001, pgs 203-205). Samples were obtained from Tennile, Ruby, Minnehaha, Walker, Lump Gulch, Buffalo and Mike Renig Gulch creeks. Core sampling of streambed substrate provides a measure or baseline of percent fine sediment less than 6.4 mm in diameter (¼ inch) in spawning habitat and represents a measure of fish habitat condition as a function of past and ongoing land-use practices (cumulative effects) and natural background processes above a critical reach in a watershed. Baselines for some critical reaches may represent conditions that have already improved as a result of mitigation and previously implemented BMPs.

Additionally, this analysis quantified both open and closed roads or trails which are considered to be hydrologically connected (i.e., have the potential to deliver sediment) and the proposed maintenance and reconstruction within 150 and 300 feet buffers, which are similar to INFISH buffers, which are standards only west of the continental divide. Beyond 300 feet, any sediment that might be produced was assumed immobilized by vegetation and other ground barriers, before reaching surface water. Conversely, not all roads within the 150 or 300 feet buffers are connected.

Stream crossings were evaluated in the project area in order to determine adequacy for AOP and flow capacity. The hydrology report discusses how culverts were evaluated for flow capacity and flood analysis. The crossings were evaluated for AOP by physical inspection (e.g. perched outlet) and velocity calculations at various flows. Culverts with physical constraints on passage (e.g. velocity or elevation change) for relevant species and life stages were identified as partial or complete barriers to passage, and targeted for improvement.

Fisheries, Affected Environment

Introduction

This section presents existing conditions and trends for fish resources within the Tennmile-South Helena Project planning area. In addition to describing the analysis area, the information is organized under two major subsections, fish populations and fish habitat, by 6th code watersheds. The first discusses the status and current known distribution of non-native or native (sensitive) fish populations and other aquatic species listed as “Sensitive” for the Helena National Forest in each of the watersheds of the project area. The second subsection gives an overview of stream habitat conditions and trends as influenced by past and ongoing land-use activities that can affect fish populations. Analysis indicators that will be utilized to compare potential effects to fisheries resources include mean percent fine sediment by depth in spawning habitat, aquatic passage barriers, hydrologically connected roads and an assessment of stream crossings, which identifies high risk crossing/culverts, miles of stream inhabited by native fish and the amount of roads decommissioned that cross or are within 150 and 300 feet of streams.

Analysis Area

The project boundary encompasses seven 6th field HUC drainages: Lump Gulch, Middle Prickly Pear, Last Chance Gulch, Upper, Middle, and Lower Tennmile Creek, all of which are east of the continental divide, and Mike Renig Gulch, located west of the Continental Divide. This report focuses on the 6th Code drainages where fisheries resources are known to exist. Four sub-watersheds were dropped from the fisheries analysis because no fish populations occur in the portion of these sub-watersheds encompassed by the project area. Only treatment units and roads that present a sediment delivery risk to streams with fish populations and habitat were analyzed.

The analysis considers proposed treatments on both FS and BLM lands in each watershed of the project area. However, no BLM lands within the project area support fisheries resources or were in the proximity to fish-bearing streams where effects could be anticipated. Consequently, BLM lands in the project area did not factor into or affect analysis of fisheries resources.

The cumulative effects area for fisheries resources extends beyond the project area where fish populations exist to the lower reaches of Lump Gulch, and Tennmile Creek in the entire Middle and Lower Tennmile 6th Code HUCs sub-watersheds. This area was chosen since activities in the planning area as well as past activities outside the planning area have the potential for generating sediment that could be delivered into receiving reaches of Tennmile or Lump Gulch and cumulatively impact fish habitat. Activities occurring within the broader watersheds including log-haul routes are taken into consideration for the cumulative effects analysis boundary. Although the geographic unit of preference for examining direct/indirect and cumulative effects is at the sub-watershed (6th-field HUC) scale, it is possible for water quality in a sub-watershed to be influenced by activities in another sub-watershed located upstream from it.

The temporal (time) extent of direct/indirect effects is determined by the duration of expected sediment delivery triggered by the proposed project, and by the expected

duration of the anticipated reductions in sediment delivery due to project activities. Estimated duration of effects typically ranges from one to five years where sediment delivery is highest in year one post-construction/treatment and declines to near zero by year six due to full re-establishment of vegetation over disturbed sites. This defines the “short-term” timeframe for sediment effects, and the “long-term” timeframe is considered to be six years and beyond.

Fish Populations in the Project Area

The Tenmile - South Helena area primarily extends east from the Continental Divide and encompasses parts of seven sub-watersheds or 6th Code drainages. It includes three fish-bearing sub-watersheds and three sub-watersheds without fish in the project area in the Upper Missouri 4th field HUC drainage (sub-basin) and a small portion of one sub-watershed in the Upper Clark Fork 4th field HUC drainage west of the Continental Divide where no fish are in the project area (Table 193). Brook trout are estimated to occupy nine streams totaling 28.3 miles of stream in the planning area while rainbow trout have been observed in two streams occupying 8 stream miles. Other fish species known to occur in the planning area include mottled sculpin. Native westslope cutthroat trout are not known to currently inhabit the project area.

Lump Gulch Watershed (6th field HUC #100301011305)

The only salmonid fish present in the Lump Gulch watershed in the project area is brook trout. They occupy a total of 8.1 stream mile in Buffalo Gulch, Little Buffalo Gulch, and Corral Creek.

Middle Prickly Pear Creek Watershed (6th field HUC #100301011308)

No fish are currently present in this watershed in the project area.

Last Chance Gulch Watershed (6th field HUC #100301011309)

No fish are currently present in this watershed in the project area.

Table 193. Current fish populations in the Tenmile – South Helena project area

6th Field HUC watershed (name)	Select Streams within HUC	Fish Species¹	Abundance Rating²	Occupied Length (mi)
100301011305 (Lump Gulch)	Buffalo Gulch	Eb	A	6.8
	Little Buffalo Gulch	Eb	U	0.8
	Travis Creek	EB	C	0.5
	Corral Creek	-	-	0
100301011308 (Middle Prickly Pear Creek)	No fish in Project Area	-	-	0
100301011309 (Last Chance Gulch)	No fish in Project Area	-	-	0
100301011401 (Upper Tenmile Creek)	Tenmile Creek	Rb	A	7.5
		Eb	C	12.1

	Minnehaha Creek & Section 30 Trib	Eb	A	2.8
	Moose Cr	Eb	A	1.6
	Ruby Cr	Eb	C	1.2
	Monitor Creek	Eb	A	1.5
	Bear Gulch	-	-	0
	Beaver Creek	-	-	0
	Deer Creek	-	-	0
	Banner Creek	—	—	0
100301011402 (Middle Tennmile Creek)	Walker Cr & Section 5 Trib	Rb	C	0.5
	Colorado G	Eb	U	1.0
100301011406 (Lower Tennmile Cr)	No fish in Project Area	-	-	0
170102010504 (Mike Renig Gulch)	No fish in Project Area	-	-	0

¹ Species symbols: WCT = westslope cutthroat trout Eb = eastern brook trout Rb = rainbow trout

² Abundance Ratings: A standardized system adopted by MDFWP to reflect peak abundance for a discrete species, expressed in number of fish per thousand feet for streams up to 20 feet wide. **Abundant** = >99 fish per 1000 ft. **Uncommon** = 4–19 fish per 1000 ft. **Common** = 20–99 fish per 1000 ft. **Rare** = < 4 fish per 1000 ft.

Upper Tennmile Creek Watershed (6th field HUC #100301011401)

Rainbow trout occupy and are considered abundant in approximately 7.5 stream miles of Tennmile Creek extending from the northern extent of the watershed south to upstream of Rimini. The source of the rainbow trout is probably Walker Creek, which has a private pond high in the drainage that has been stocked in the past (Skaar and McGuire 2008). Brook trout are also present in this reach and extend further upstream, occupying about 12.1 stream miles in the mainstem of Tennmile Creek. In addition, brook trout are also found in Minnehaha, Moose, Ruby, and Monitor creeks in this watershed in the planning area; brook trout occupy approximately 19.2 stream miles. The only non-salmonid species known to be present is the mottled sculpin (*Cottus bairdii*) (Skaar and McGuire 2008). Sampling in 2004 found no sculpin present in any of tributary, but were present in Tennmile Creek below Minnehaha Creek as well as downstream.

Middle Tennmile Creek Watershed (6th field HUC #100301011402)

Sampling of Walker Creek and its tributary in T9NR5W, Section 5 in the project area determined rainbow trout present and common in a one half mile reach. Brook trout have been sampled in the headwaters of Colorado Gulch, but were uncommon.

Lower Tennmile Creek Watershed (6th field HUC #100301011406)

No fish are currently present in this watershed in the project area.

Mike Renig Gulch Watershed (6th field HUC #170102010504)

No fish are currently present in the small ridge-top areas of the project-area portion of this watershed.

Non-native fishes

Non-native fish in planning area streams include rainbow trout and brook trout. These non-native trout do not occur in all streams or in equal proportions throughout planning area streams. The introduction of non-native trout into Montana streams began with brook trout, rainbow trout, and brown trout in 1889 (Brown 1971). Although it was not understood at the time of these introductions, non-native trout imposed inherent risks to the viability of native WCT populations that historically occupied area streams east of the Continental Divide.

Rainbow trout were introduced from numerous west-coast hatchery stocks into virtually every suitable habitat in Montana beginning in 1889 (Brown 1971, Fredenberg and Gould 1990). Within the planning area, rainbow trout are found in mainstem Tenmile and Walker creeks. Rainbow trout hybridize with native westslope cutthroat trout risking the loss of genetic integrity in localized westslope populations. In addition to hybrid influence, rainbow trout compete with native fishes for food, space, and cover.

Brook trout were endemic to the Appalachian Mountains and first introduced into Montana in 1889 and extensively propagated and distributed throughout the state until 1954. Brook trout prefer cold, small headwater streams, which are also preferred by most remaining native westslope cutthroat trout populations. Because brook trout interact negatively through predation, competition and/or replacement with indigenous westslope cutthroat trout, they can substantially reduce or totally eliminate local westslope cutthroat trout populations altogether from their historic habitats (Liknes 1984, Griffith 1988, Rieman and Apperson 1989, Fauch 1988, 1989). Since brook trout spawn in the fall and are more sediment-tolerant than native cutthroat, they tend to have a competitive size and numerical advantage over westslope cutthroat trout in their first year of life. Westslope cutthroat trout are not known to be present in any streams in the project area while brook trout currently occupy 28.3 miles of stream in three of the 6th field HUC watersheds in the analysis area and are the most widely distributed fish species.

Native Species

Native fishes historically known to occupy streams in the planning area include sensitive westslope cutthroat trout, mottled sculpin and possibly mountain whitefish and longnose suckers. Bull trout, native only in the Columbia and Saskatchewan River drainages in Montana, are not found within the project area boundary. The invertebrate species known as the western pearlshell mussel was added to the Forest Service Northern Region list of aquatic sensitive species in 2011. Further discussion about the sensitive species westslope cutthroat trout and the western pearlshell mussel follows under separate sections that briefly address each species.

Westslope Cutthroat Trout Status Overview

In Montana, westslope cutthroat trout were thought to be restricted to headwater streams as early as 1959 (Hanzel 1959). Since 1966, they have been included in various “watch lists” of agencies and conservation groups. From 1966 to 1972, the subspecies were listed on the USFWS’s Red Book of threatened and endangered species, but after passage of the Endangered Species Act in 1973, they were dropped from that list over uncertainty

about their classification and classified as a Category 2 Candidate species by the USFWS until deletion of that category in 1996.

In May, 1997, the USFWS was petitioned to list westslope cutthroat trout as threatened under the Endangered Species Act. In 2000, several environmental groups brought suit to compel the USFWS to issue its final determination as to the species' listing; the USFWS determined listing was "not warranted" but plaintiffs later filed suit claiming the USFWS failed to reconcile its recognition of hybridization as a threat to westslope cutthroat trout viability. In March 2007, the District Court for the District of Columbia concluded in favor of the USFWS's Reconsidered Listing Determination that westslope cutthroat trout is not warranted for listing at this time.

Currently, westslope cutthroat trout are referred to as a "Species of Concern" by the State of Montana, a "Special Status Species" by the Bureau of Land Management (BLM), and a "Sensitive Species" by the northern region of the Forest Service. The HNF Forest Plan (USDA Forest Service 1986) identifies westslope cutthroat trout as its fish management indicator species (MIS). Factors associated with declines in westslope cutthroat trout that lead up to these special categories include introductions of non-native fish, habitat loss or degradation, and over-exploitation (Behnke 1992; Hanzel 1959; Liknes and Graham 1988; McIntyre and Reiman 1995).

The latest westslope cutthroat trout status assessment by Shepard et al. (2003) estimates that of the 39 percent of historical habitat currently occupied in Montana, the decline of the westslope cutthroat trout subspecies is most pronounced east of the Continental Divide. East of the Divide, genetically pure WCT populations occupy less than 5 percent of their historical habitat (Shepard et al. 2003), and most of those populations have been restricted to headwater streams primarily above barriers. These isolated populations (isolates) are considered extremely important to the conservation and restoration of westslope cutthroat trout.

Western Pearlshell Mussel Status Overview

Western pearlshell mussels (*Margaritifera falcata*) may be one of the longest living freshwater invertebrates and animals. Specimens have been aged at greater than 90 years (Vannote and Minshall 1982). These mussels are found in cool, stable running, generally low to moderate gradient streams and rivers. Swift stream velocities can limit where mussels can occur in streams. They are most commonly found in stable gravel and pebble benthic substrate, but can occur in sand or gravel among cobble and boulders in moderate to higher gradient larger rivers. They usually occupy reaches of stream where the riparian zone is dominated by willows or alders.

The larval stage of this mussel (glochidia) briefly parasitizes a host fish, westslope cutthroat trout, by attaching to the gills. They fall off the host as a juvenile mussel. The larval parasitism on fish enables upstream transport to habitats otherwise difficult to reach by relatively immobile adult mussels. Western pearlshell glochidia are considered highly host specific (Bauer 1987) as they are typically restricted to salmonid fishes. The western pearlshell mussel continues to experience substantial range reductions over the last 100 years. The primary cause of stream habitat deterioration in Montana is high fine sediment load, related to agricultural practices, which is one of the most serious

pollutants of streams systems. Excess fine sediment can degrade mussel habitats by decreasing substrate permeability. This has a smothering effect on juvenile mussels and limits successful recruitment (Stagliano 2010).

The Montana Natural Heritage database contains no records for this species in the project area, and surveys of in the Tennmile Creek drainage have not located any western pearlshell mussels (Stagliano 2014). Tennmile Creek has been designated as predicted pearlshell habitat in the very lower reaches of FS administered lands (Stagliano 2010).

Fish Habitat

Background

Fish habitat in the project area is the product of interactions among underlying geologies, soils, topography, vegetation, climate, and hydrology unique to the watershed (Meehan and Bjornn 1991; Swanston 1991). More details about elements influencing fish bearing streams in Lump Gulch, Upper and Middle Tennmile subwatersheds are discussed under the “Affected Environment” sections in the Tennmile – South Helena Project soil and hydrology reports. Drainage characteristics and processes remain fairly constant, setting up conditions for optimum productivity of aquatic life forms (Meehan and Bjornn 1991). When natural disturbance reshapes stream channels, the actual effects on aquatic organisms are often short-lived. In their natural context, processes like fire, floods, insect infestations, and animal activities, such as the influence of beaver, operate on the stream system to produce improved habitat quality and productivity in the long term (Swanston 1991).

Human land-use activities can disrupt the balance of these interactions producing persistent changes in habitat that can impact natural fish production and population viability (Meehan and Bjornn 1991; Waters 1995). The Tennmile - South Helena Project area has traditionally been managed for non-fishery resources, which includes use as a municipal watershed, mining, timber harvest, livestock grazing and transportation. Cumulatively these activities may impair stream structure and function to varying degrees by increasing erosion and sedimentation, impacting water quality, altering flows, reducing vegetation cover, and destabilizing or degrading channels. Past and ongoing actions in the project area cumulatively set the stage for existing stream habitat conditions. For example, the transportation system has been assessed for hydrologically connected road segments and culvert crossings, which can result in elevated fine sediment loading in fish reproductive habitat. Without mitigations or other corrective measures, these activities can suppress natural fish production capabilities (carrying capacity) of streams (Hicks et al. 1991).

Aquatic habitat management requires identifying and mitigating human activities that impair watersheds in general and water bodies in particular. Vegetation treatments for this project have been restructured to minimize impacts to stream corridors. This has been accomplished by dropping or altering treatment units, applying soil and water mitigation measures, and complying with the state SMZ law and rules. Maintaining the integrity of stream corridors with riparian buffers in the planning area ensures protection of streamside riparian cover, instream cover (LWD), temperature, and stream channel structure and stability.

Fish production is limited and the composition and diversity of aquatic insects is affected by various stressors in project area streams, but excessive sediment beyond natural background levels has been identified as a principle limiting factor and dominant effect for fisheries habitat from forest management activities, whether the sediment results from roads, timber management, mining or livestock grazing (Meehan 1991, pg 5-6). Waters (1995) identified roads as having a dominant effect in that regard. Although activities themselves may differ widely, the effects of increased sedimentation on fish habitat will be the same. Since the streambed is generally accepted as the integrator of processes and land-use practices occurring upstream, the collective effects of the past and ongoing activities in the planning area are best measured in the streambed of critical reaches that receive sediment generated by natural processes and human disturbance. While recent data is available only for Tenmile Creek, spawning gravel fine sediment levels have been sampled in streams from all 6th-field HUCs that are inhabited by fish in the planning area (Table 194). Although previous activities may have provided for decreases in the current levels of fines in spawning substrate, these values can provide an important baseline and identify relative differences between watersheds.

Table 194. Summary of mean % fines (<1/4 inch dia.) in spawning habitat of select streams as an indicator of past and cumulative effects.

6 th Field HUC sub-watershed (name)	Stream(s) sampled for sediment analysis	Mean % fines in spawning habitat	USEPA reference standard (%)	Roadless Area reference (%)
100301011305 (Lump Gulch)	Buffalo Gulch Creek	47.9	32.5	31.9
100301011401 (Upper Tenmile Creek)	Tenmile Creek*	29.1	32.5	31.9
	Minnehaha Creek	38.7		
	Ruby Creek	35.5		
	HUC mean	33.5		
100301011402 (Middle Tenmile Creek)	Tenmile Creek	34.5	32.5	31.9
	Walker Creek	52.5		
	HUC mean	43.5		

Comparing average sediment levels from the project area with those taken from the Lake Helena Watershed Planning Area, which were about 32.5 percent \pm 9.9 percent (USEPA 2004, pgs 225-231) or 31.9 percent based on limited sampling from unmanaged drainages or portions of undisturbed drainages on the Helena NF provides a plausible mean reference value for fisheries management goals while taking into account an approximate 10 percent natural variation. Based on core sampling data available, mean fine sediment in spawning habitat for one of the three 6th-field HUCs (Upper Tenmile Creek) is within the accepted range of variation but exceeds the upper range of variation for fish habitat management goals in the Lump Gulch and Middle Tenmile Creek subwatersheds (Table 194). In the Upper Tenmile Creek subwatershed, the mean percent fines were below reference standards in the Tenmile Creek itself, where data was collected in 2013, and moderately elevated in Minnehaha and Ruby creeks. Walker Creek sediment levels were the highest observed in the planning area and was responsible for the increased mean for the HUC; Tenmile Creek in the middle Tenmile Subwatershed was slightly elevated above the mean reference standards. Buffalo Gulch Creek in the Lump Gulch subwatershed had mean percent fines higher than the expected variation.

Woody debris is an important feature in stream habitat; it forms pools, increases biological productivity, provides cover and creates habitat complexity. Management objectives should provide an amount and distribution of woody debris characteristic of functioning aquatic and riparian ecosystems. Large woody debris recruitment is likely lower than its natural potential in most of the streams in the project area due to historic transportation systems, residential development, farming, ranching, logging and mining activities that have cleared some reaches of riparian areas and reduced wood available in the riparian area.

Cold water is a key factor related to the health and survival of trout. Data on the distributions of various species of native and nonnative salmonids in nature suggest

native westslope cutthroat trout are typical in thermal tolerance and have considerable overlap with rainbow and brook trout (USFWS 1999). However, westslope cutthroat are most common in streams that rarely exceed 59 degrees Fahrenheit (15°C) (Isaak 2014) and today, remaining stocks of westslope cutthroat trout occur primarily in colder, headwater streams (Liknes and Graham 1988). However, warmer temperatures, lower stream gradients, and the size advantage afforded the fall-spawned, young-of-the-year brook trout are important mechanisms in replacement of cutthroat trout by nonnative brook trout in streams (DeStaso and Rahel 1994). These factors, in combination with other habitat perturbations in the past likely resulted in extirpation of native salmonids in the planning area.

Other riparian, wetland features and conditions are described in the Tenmile – South Helena Hydrology Specialist report.

Fisheries, Environmental Consequences

Introduction

Project design has minimized or eliminated potential impacts to some resource indicators, including large wood recruitment and stream temperature, habitat complexity and stability, and spawning gravel sedimentation. Other parameters that could affect aquatic habitat and species are evaluated in the hydrology specialist report (i.e. fine sediment delivery from roads and treatment units to stream channels, increase in water yield). This report will discuss these parameters, and will also address the following as aquatic habitat/species resource indicators:

- Partial or complete barriers to aquatic organism passage (AOP)—number of AOP barriers identified in the project area
- Number of high risk culverts
- Maintenance or reconstruction of roads within 150 and 300 feet of a stream (high risk roads)

Effects Common to All Alternatives

The physical presence of high-risk roads (defined as those within approximately 150-300 feet of a stream capable of sediment delivery to the watercourse) can have an adverse effect on aquatic resources; the associated stream crossings that remain on the landscape represent ongoing effects that would continue since no alternative would directly eliminate or relocate the physical presence of all those features from stream corridor areas. Consequently, sediment delivery from high risk roads remains a common element in all alternatives simply due to where and how certain road segments are hydrologically connected to the stream system. Additionally, large volumes of sediment held in storage as road fill associated with some culverts remain a risk to downstream fish habitat. Where stream crossings and roads encroach on streams there would continue to be alterations of channel morphology, disruption to floodplain processes decreasing pool frequency, less bank cover, reduced quality spawning gravels, higher energy gradients, and partially fragmented fish habitat. In combination with the transportation system, the City of Helena's Tenmile Creek municipal water supply system affects sediment

transport in project area streams by at diversions by physically changing stream gradients as well as water withdrawals reducing sediment transport capabilities.

Past mining activity has left a legacy of impacts to aquatic systems throughout much of the project area. In some cases, these activities are ongoing. Primary mining impacts to aquatic resources include channel modification as well as elevated in-stream levels of fine sediment and other contaminants. Contaminants include various heavy metals, which are toxic to aquatic organisms even at concentrations below acute mortality levels.

Livestock grazing and trampling in riparian areas and cattle trailing along streams within grazing allotments contribute to elevated fine sediment levels and stream temperatures in affected streams. No alternatives would influence livestock management in a way that would result in measurable effects on aquatic resources.

Forest visitor activities in riparian and streamside areas (e.g. camping, recreational residences, OHV use, firewood cutting) as well as effects associated with residents accessing private inholdings within the Forest and Project area boundary have impacted aquatic resources in the project area by damaging or removing riparian vegetation, exposing streamside soils to erosion, rutting and compacting soils, as well as the use of roads affecting maintenance needs and increasing sediment delivery to streams. These impacts can result in elevated sediment delivery to channels as well as reduced shading and LWD recruitment.

Past timber harvest activities done with inadequate resource protection measures, as well as prescribed burning and wildfire, have impacted aquatic resources through sedimentation and removal of vegetation within stream buffers.

Effects Common to All Action Alternatives

Effects common to all action alternatives include activities that are intended to improve water quality and aquatic habitat conditions in project area streams, including streams that deliver water to the City of Helena's municipal water supply intakes. These activities also move the forest toward meeting the restoration goals of the Lake Helena TMDL and reestablish a native fish species into the project area. The work includes 25 acres of wetland restoration along forest road 299, which would involve filling approximately 1,700 feet of drainage ditch to restore the water level and up to 400 feet of road reconstruction to provide better drainage control through the road. Details include:

- Road 299 re-routes—approximately 2,000 feet of road would be relocated out of a wetland and onto a drier, low-gradient side slope.
- Road decommissioning—approximately 15 miles of road segments would be decommissioned, some prior to vegetation activities and some after completion of project activities.
- Westslope Cutthroat Trout restoration—in cooperation with Montana FWP, the project would remove non-native species above existing barrier structures in Moose Creek and lower Minnehaha Creek by mechanical methods such as electrofishing, and reintroduce native westslope cutthroat trout. The proposal implements guidance of the Montana Cutthroat Trout Steering Committee (MCTSC) and the intent of the memorandum of understanding (MOU) developed

by its members, which included fisheries managers, conservation groups, tribes, and various industry concerns to ensure the long-term, self-sustaining persistence of westslope cutthroat trout within their historic range utilizing measures that include reestablishing non-hybridized populations where they have been extirpated (MCTSC 2007). No ground-disturbance would occur for this activity.

While the proposed road decommissioning constitutes approximately 15 miles of road segments, those portions that may be hydrologically connected comprise a total of 1.9 miles within 150 feet of streams and 3.2 miles within 300 feet of streams (Table 195). Most of the proposed decommissioning is proposed in the Upper Tenmile 6th Code HUC. A total of six stream crossings are also proposed to be decommissioned, five of which are in the Upper Tenmile 6th Code watershed (Table 195). Four culverts in the project area were previously identified as partial or complete barriers to Aquatic Organism Passage (AOP). Field examinations showed one in the Travis Creek drainage would provide aquatic benefits and was located on Forest Service lands. Another in the Upper Tenmile Creek 6th code watershed has recently been replaced as part of a Federal Highway Administration Project. Please refer to the Tenmile - South Helena Hydrology Report for details of culverts proposed for replacing.

Table 195. Miles of road and stream crossings proposed to be decommissioned within 150 and 300 feet of streams in each fish bearing 6th field HUC subwatershed in the Tenmile - South Helena Project Area.

6th Field HUC sub-watershed (name)	Miles decommissioned within 150 feet of stream buffer	Miles decommissioned within 300 feet of stream buffer	Stream crossings proposed for decommissioning
100301011305 (Lump Gulch)	0.1	0.1	1
100301011401 (Upper Tenmile Creek)	1.8	3.1	5
TOTAL	1.9	3.2	6

A direct effect common to both action alternatives is the proposed 200 yard private land buffer in the headwaters of Colorado Gulch in the Middle Tenmile Creek (100301011406) 6th field HUC, which would affect approximately 740 feet of a Colorado Gulch tributary where brook trout have been sampled. The hazard fuel reduction would reduce trees available for recruitment of large woody debris within the 740 feet reach and may reduce shade in the treated area and slight increases in water temperatures. Trees upstream would still provide for large woody debris recruitment over the long term. No roads would impact the treatment reach. Effects to the brook trout population in the stream are not anticipated to affect the viability of the population.

Based on analysis of sediment delivery from roads to stream channels in the Tenmile - South Helena Hydrology Report, we anticipate that from three to five years following the implementation of BMPs, a predicted decrease in sediment delivery in the Upper Tenmile Creek 6th code watershed from 14.0 tons per year to 2.2 tons per year could be realized.

The predicted reduction in the Lump Gulch 6th code watershed is smaller, decreasing from 1.7 to 1.1 tons per year.

Alternative 1, No Action

Direct/Indirect Effects

Under alternative 1, no new management actions are proposed. If no new actions are undertaken, no new direct effects to aquatic wildlife habitats and populations would occur. Past and ongoing management activities, including road use, undersized/barrier culverts, mining and livestock impacts would continue to affect aquatic related resource values.

Under the no-action alternative, improvements for the existing road network that are proposed in the action alternatives would not occur. Sediment reduction measures on roads outlined in the transportation specialist report would result in a reduced sediment delivery to streams from project-area roads, as outlined in the hydrology specialist report. These improvements would not occur, or would occur in a piecemeal manner as funds become available, under the no-action alternative.

Irreversible and Irretrievable Commitments

There would be no irreversible commitments in the selection or implementation of alternative 1 related to fish and other aquatic species. There would be no permanent alteration of habitat quality or a projected loss of a population. Opportunity costs associated with not performing the road improvement work of the action alternatives are reversible, but the delay in improving aquatic related habitat conditions would result in an irretrievable commitment of an unknown duration. Failure of high risk culverts could lead to long term degradation of aquatic habitat and reduced aquatic productivity.

Cumulative Effects

Cumulative effects for alternative 1 are common to the other alternatives and discussed under the “Effects Common to All Alternatives” section above. There are no cumulative effects that would be unique to alternative 1.

Alternative 2

Direct/Indirect Effects

No direct effects to fish or other aquatic species and individual organisms are anticipated from selecting and implementing alternative 2. Direct mortality from project connected actions is not foreseeable or predicted to occur.

Indirect effects from this alternative would be associated with changes in sediment yield related to management activities, slight reductions in large woody debris recruitment, and improvement of fish passage. Modelling of sediment delivery from proposed treatment units under alternative 2 in the Tenmile - South Helena Hydrology Report predicted an average of 96 percent (range = 68-100 percent) probability that sediment from treatment units would not reach a stream channel in the first year post-treatment. Roads utilized for haul routes (32.9 miles) and the miles of temporary roads (35.4 miles) proposed for use in

alternative 2 in the 6th code drainages where fish are present in the project area total 68.3 miles (Table 196). High risk roads where proposed activities would occur under alternative 2 total 6.3 miles for roads within 150 feet of streams and 13.4 miles for roads within 300 feet of streams (Table 197). The high risk haul routes and temporary roads represent 22.4 percent and 25.3 percent of the high risk roads within 150 feet and 300 feet, respectively in the Lump Gulch and Upper Tenmile Creek subwatersheds. Reconstruction or maintenance is proposed for 92 percent of the high risk roads proposed for use in the Lump Gulch HUC and 100 percent in the Upper Tenmile 6th code HUC (Table 198). Haul routes, temporary roads and treatment units in other non-fish bearing subwatersheds are anticipated to have no measureable effect on aquatic populations due to the distance between activities and the aquatic resources. A total of three stream crossings associated with proposed temporary roads in fish bearing subwatersheds is proposed in alternative 2 (see the Hydrologist Specialist Report); two of the stream crossings would be in the Lump Gulch subwatershed and one stream crossing in Upper Tenmile Creek subwatershed. BMPs and permitting conditions would minimize short term increases in sediment delivery to the streams associated with these crossings, but would not completely eliminate it. However, the potential sediment delivery modeled in the Hydrology Specialist report estimated no sediment delivery in the Lump Gulch and the Upper Tenmile 6th code drainage. Large woody debris recruitment has the potential to be slightly reduced from existing conditions primarily in two harvest units, one in Lump Gulch and one in Upper Tenmile Creek subwatersheds. However, compliance with Montana Streamside Management Zone Laws and Rules providing for tree retention, the implementation of the project design criteria, and the relatively short reaches where streams are within harvest units would prevent adverse effects. Stream water temperatures would not be expected to demonstrate a measureable increase in the project area in fish bearing waters for the same reason identified above. SMZ laws and rules and the Tenmile - South Helena project design criteria provide protection to fish bearing streams from adverse effects from proposed burn treatment units in alternative 2.

Table 196. Alternative 2 haul route and temporary road construction miles within the Forest Boundary in each fish bearing 6th field HUC subwatershed in the Tenmile – South Helena project area.

6th Field HUC sub-watershed (name)	Miles of Haul Route	Miles of Temporary Road Construction	Total (Miles)
100301011305 (Lump Gulch)	12.5	22.0	34.5
100301011401 (Upper Tenmile Creek)	20.4	13.4	33.8
TOTAL	32.9	35.4	68.3

Table 197. Alternative 2 haul route and temporary road construction miles within 150 and 300 feet of streams within the Forest Boundary in each fish bearing 6th field HUC subwatershed in the Tenmile – South Helena Project Area.

6th Field HUC sub-watershed (name)	Miles of Roads within 150 Feet	Miles of Haul Routes within 150 Feet	Miles of Temporary Roads within 150 Feet	Total Of Haul Roads and Temp Roads within 150 Feet
100301011305 (Lump Gulch)	11.1	2.4	0.6	3.0
100301011401 (Upper Tenmile Creek)	17.0	2.9	0.4	3.3
TOTAL	28.1	5.3	1.0	6.3
TOTAL In all watersheds	46.9	6.4	1.0	7.4
6th Field HUC sub-watershed (name)	Miles of Roads within 300 Feet	Miles of Haul Routes within 300 Feet	Miles of Temporary Roads within 300 Feet	Total Of Haul Roads and Temp Roads within 300 Feet
100301011305 (Lump Gulch)	19.5	3.8	1.8	5.6
100301011401 (Upper Tenmile Creek)	33.4	6.3	1.5	7.8
TOTAL	52.9	10.1	3.3	13.4
TOTAL In all subwatersheds	77.7	10.4	3.4	13.8

Table 198. Alternative 2 haul route and miles proposed for improvements to meet BMP standards within 150 and 300 feet of streams within the Forest Boundary in each fish bearing 6th field HUC subwatershed in the Tenmile – South Helena Project Area.

6th Field HUC sub-watershed (name)	Miles of Haul Routes within 150 Feet	Miles (Percent) of Haul Routes within 150 Feet improved to meet BMP standards	Miles of Haul Routes within 300 Feet	Miles (Percent) of Haul Routes within 300 Feet improved to meet BMP standards
100301011305 (Lump Gulch)	2.4	2.2(92%)	3.8	3.5(92%)
100301011401 (Upper Tenmile Creek)	2.9	2.9(100%)	6.3	6.3(100%)
TOTAL	5.3	5.1(96%)	10.1	9.8(97%)
TOTAL In all subwatersheds	6.4	5.2(81%)	10.4	10.1(97%)

Irreversible and Irretrievable Commitments

There would likely be no irreversible commitments in selecting and implementing alternative 2.

Cumulative Effects

Effects from past and existing activities in the analysis area were considered to be the same for all three alternatives and are covered under the ‘Effects Common to All Alternatives Section. Alternative 2 would reduce the cumulative effects of the existing road network on aquatic resources by reducing sediment loading to streams by improving 96 to 97 percent of the high risk haul roads to meet BMP standards in the two fish bearing subwatersheds in the project area (Table 198). The effects of these project elements are discussed above in the Indirect Effects section. Provided that design features are implemented effectively, no aspect of the project was judged to exacerbate cumulative impacts on aquatic resources.

Alternative 3

Direct/Indirect Effects

No direct effects to fish or other aquatic species and individual organisms are anticipated from selecting and implementing alternative 3. Direct mortality from project connected actions is not foreseeable or predicted to occur.

Indirect effects from this alternative would be associated with changes in sediment yield related to management activities, potential changes in large woody debris recruitment, and improvement of fish passage. As with alternative 2, modelling of sediment delivery from proposed treatment units under alternative 3 in the Tenmile - South Helena Hydrology Report predicted a low probability that a negligible amount would reach a stream channel in the first year post-treatment. Roads utilized for haul routes (28.0 miles) and the miles of temporary roads (20.7 miles) proposed for use in alternative 3 in the 6th code HUCs where fish are present in the project area total 48.7 miles (Table 199). High

risk roads where proposed activities would occur under alternative 3 total 7.9 miles for roads within 150 feet of streams and 15.3 miles for roads within 300 feet of streams (Table 200). The high risk haul routes and temporary roads represent 28.1 percent and 28.9 percent of the high risk roads within 150 feet and 300 feet, respectively in the Lump Gulch and Upper Tenmile Creek subwatersheds combined. Reconstruction or maintenance is proposed for 91 to 95 percent of the high risk roads proposed for use in the Lump Gulch HUC and 100 percent in the Upper Tenmile 6th code HUC (Table 201). Haul routes, temporary roads and treatment units in other non-fish bearing subwatersheds are anticipated to have no measureable effect on aquatic populations due to the distance of activities from aquatic resources. A total of five wetland or stream crossings associated with proposed temporary roads in fish bearing subwatersheds is proposed in alternative 2 (see the Hydrologist Specialist Report); BMPs and permitting conditions would minimize the short term increases in sediment delivery to streams associated with these crossings. Analysis of alternative 3's predicted sediment yield is detailed in the hydrology specialist report; the estimates of sediment delivery from the temporary roads for alternative 3 totaled 0.2 tons per year in the fish bearing subwatersheds. The majority of this is in the Upper Tenmile Creek 6th code HUC. Large woody debris recruitment has the potential to be slightly reduced from existing conditions primarily in two harvest units, one in Lump Gulch and one in Upper Tenmile Creek subwatersheds. However, compliance with Montana Streamside Management Zone (SMZ) laws and rules providing for tree retention, the implementation of the project design criteria, and the relatively short reaches where streams are within harvest units would prevent adverse effects. Stream water temperatures would not be expected to demonstrate a measureable increase in the project area in fish bearing waters for the same reason identified for large woody debris. Burn treatment unit implementation in compliance with SMZ laws and rules and the Tenmile - South Helena project design criteria provide protection from adverse effects and sediment delivery to fish bearing streams in the project area in alternative 3.

Table 199. Alternative 3 haul route and temporary road construction miles within the Forest Boundary in each fish bearing 6th field HUC subwatershed in the Tenmile – South Helena Project Area.

6th Field HUC sub-watershed (name)	Miles of Haul Route	Miles of Temporary Road Construction	Total
100301011305 (Lump Gulch)	6.8	9.5	16.3
100301011401 (Upper Tenmile Creek)	21.2	11.2	32.4
TOTAL	28.0	20.7	48.7

Table 200. Alternative 3 haul route and temporary road construction miles within 150 and 300 feet of streams within the Forest Boundary in each fish bearing 6th field HUC subwatershed in the Tenmile – South Helena Project Area.

6th Field HUC sub-watershed (name)	Miles of Roads within 150 Feet	Alternative 3		
		Miles of Haul Routes within 150 Feet	Miles of Temporary Roads within 150 Feet	Total Of Haul Roads and Temp Roads within 150 Feet

6 th Field HUC sub-watershed (name)	Miles of Roads within	Alternative 3		
100301011305 (Lump Gulch)	11.1	2.0	0.3	2.3
100301011401 (Upper Tenmile Creek)	17.0	5.1	0.5	5.6
TOTAL	28.1	7.1	0.8	7.9
TOTAL In all subwatersheds	46.9	7.1	0.8	7.9
6 th Field HUC sub-watershed (name)	Miles of Roads within 300 Feet	Miles of Haul Routes within 300 Feet	Miles of Temporary Roads within 300 Feet	Total Of Haul Roads and Temp Roads within 300 Feet
100301011305 (Lump Gulch)	19.5	3.3	0.8	4.1
100301011401 (Upper Tenmile Creek)	33.4	9.5	1.7	11.2
TOTAL	52.9	12.8	2.5	15.3
TOTAL In all subwatersheds	77.7	12.9	2.5	15.4

Table 201. Alternative 3 haul route and miles proposed for improvements to meet BMP standards within 150 and 300 feet of streams within the Forest Boundary in each fish bearing 6th field HUC subwatershed in the Tenmile – South Helena Project Area.

6th Field HUC subwatershed (name)	Miles of Haul Routes within 150 Feet	Miles (Percent) of Haul Routes within 150 Feet improved to meet BMP standards	Miles of Haul Routes within 300 Feet	Miles (Percent) of Haul Routes within 300 Feet improved to meet BMP standards
100301011305 (Lump Gulch)	2.0	1.9(95%)	3.3	3.0(91%)
100301011401 (Upper Tenmile Creek)	5.1	5.1(100%)	9.5	9.5(100%)
TOTAL	7.1	7.0(99%)	12.8	12.5(98%)
TOTAL In all subwatersheds	7.1	7.0(99%)	12.9	12.5(97%)

Irreversible and Irretrievable Commitments

There would likely be no irreversible commitments in selecting and implementing alternative 3.

Cumulative Effects

Effects from past and existing activities in the analysis area were considered to be the same for all three alternatives and are covered under the “Effects Common to All Alternatives Section”. Alternative 3 would reduce the cumulative effects of the existing road network on aquatic resources by reducing sediment loading to streams by improving 98 to 99 percent of the high risk haul roads to meet BMP standards in the two fish bearing subwatersheds in the project area (Table 201). The effects of these project elements are discussed above in the Indirect Effects section. Provided that design features are implemented effectively, no aspect of the project was judged to exacerbate cumulative impacts on aquatic resources.

Conclusions

The physical presence of high-risk roads (defined as those within approximately 150-300 feet of a stream capable of sediment delivery to the watercourse) can have an adverse effect on aquatic resources, affecting fish population dynamics and aquatic productivity. Both action alternatives would include 3.2 miles of road decommissioning and six stream crossings that are proposed to be decommissioned. Alternative 2 proposes a greater overall total miles of haul routes and temporary roads than alternative 3, but actually has fewer miles of haul routes within 150 and 300 feet of streams. Consequently, under alternative 2 there would be fewer high risk road reaches in riparian areas exposed to truck traffic associated with the project, even though the additional acres of vegetative treatment may result in more traffic on the haul roads than that proposed for alternative 3. While alternative 3 may have more miles of haul routes within 150-300 feet of streams than the other action alternative, it also would provide the most miles of road maintenance and reconstruction that would implement BMP to reduce effects to streams in the project and cumulative effects areas. Both action alternatives are anticipated to result in benefits that reduce sediment delivery from existing haul routes for the duration

of effectiveness of the BMPs implemented that would maintain or improve the percent fines in spawning habitat in fish bearing streams in the project and cumulative effects area. Alternative 2 proposes three temporary stream crossings resulting in no net predicted increase in potential sediment delivery to fish bearing subwatersheds.

Alternative 3 proposes five crossings, four stream (one of which is perennial) and one wetland crossing, and an estimate 0.2 tons of potential sediment delivery to fish bearing subwatersheds per year in the short term. BMPs and permitting conditions would minimize short term increases in sediment delivery to the streams associated with these crossings.

Partial or complete barriers to aquatic organisms have been identified and will be considered for replacement in the Lump Gulch subwatershed. Sediment delivery points associated with high risk culverts will be identified in the hydrologist specialists report.

Both action alternatives also provide for wetland restoration and there establishment of westslope cutthroat trout populations in reaches of Moose and Minnehaha creeks in the Upper Tenmile Creek subwatershed where no native sport fish are currently present.

The BLM lands in the project area do not include any fish-bearing streams and proposed treatments would have a low probability of any measurable effect on aquatic resources.

Forest Plan and BLM Resource Management Plan Consistency

Alternatives 2 and 3 comply with the Helena National Forest Plan, the Butte Resource Management Plan, state and local laws, regulations, policies and plans, because both action alternatives result in anticipated improvement in road BMPs reducing sediment delivery to riparian areas benefiting aquatic resources in the project area. Additionally, wetland restoration, native fish restoration, and road and stream crossing decommissioning will improve watershed conditions. Although the INFISH standards and guidelines, amended to the Forest Plan in 1995, do not apply to riparian habitats in the project planning area since they are east of the continental divide, the analysis examined effects in a consistent manner as if the strategy applied to the riparian buffer areas.

Table 202. Analysis area species and summary of effects.

Species	Species Status	Present In Action Area: Habitat or Detections	Effects Determination	Rationale for Determination
Fishes				
westslope cutthroat trout (<i>Oncorhynchus clarki lewisi</i>)	USFS Sensitive	No detections. Potential habitat present.	No Impact	Not present in project area)
bull trout (<i>Salvelinus confluentus</i>)	ESA Threatened	No	No Effect	Not present in project area
Invertebrates				
western pearlshell mussel (<i>Margaritifera falcata</i>)	USFS Sensitive	No	No impact	Not present in project area

Recreation

Introduction

The following section discusses the recreation resources' affected environment and environmental consequences of the proposed activities on lands administered by the Forest Service and Bureau of Land Management (BLM) for the Tennile - South Helena Project. This analysis describes the existing recreation activities, settings and opportunities within the Tennile - South Helena Project area, and describes the potential effects to recreation from the proposed activities.

The forested portion of the project area has a high density of insect and disease caused mortality and these dead trees pose risk to recreationists. Within the project area, most roadsides and developed recreation sites have been cleared of hazard trees. However, hazard tree mitigation has not been completed on all trails in the project area. Many sections of trail have high densities of dead trees. In the project area it is common for fallen trees to obstruct travel and lead to the creation of detours or new bypass routes.

In summary, under the no action alternative, summer and fall disruptions to recreation access would result from not addressing the Mountain Pine Beetle outbreak, and the associated fallen trees that a lack of treatment would produce. Under the action alternatives, a certain degree of temporary motorized vehicle travel restrictions or delays could be expected, primarily during the summer, fall, and winter. Under these alternatives, although access to recreation opportunities may be disrupted, the disruptions would be temporary, and would be the direct result of treatment implementation. The action alternatives could be expected to have a short-term negative impact in terms of displacement of hunting and winter motorized recreation opportunities in the project area,

as a result of treatment implementation. Long-term, the action alternatives would have a positive impact on recreation opportunities by improving the recreation setting, safety along trail corridors, and reduce impediments caused by fallen trees.

Assumptions

General

Recreation use of the project area would likely continue or increase as the Helena area and surrounding communities' populations increase. The population trends in this area indicate an increase in population amongst a middle-aged demographic, which is the segment of the population most likely to participate in outdoor recreation activities (State of Montana, Census & Economic Information Center, Montana Commerce Department 2015). Furthermore, the Forest Plan projects increases in all categories of recreation use on the Forest over the next several planning decades, although capacity is still expected to exceed demand (USDA 1986, Chapter 2)

Project Implementation

During initial implementation of the project (two to four years), to provide for public safety, portions of the National Forest System (NFS) lands within the project boundary would be closed to public use as needed to facilitate treatments. The use of mechanized equipment is expected to occur on the largest scale during the early phases of implementation. After the first few years, closures would be smaller in scale, less frequent and shorter duration. Design criteria are included to address recreation use and public safety during implementation.

Implementation would be phased across the project area. As much as possible, phasing implementation would limit closures to localized geographic areas, while other portions of the project area would remain available for public activities.

The initial phases for implementation would focus on rearrangement of fuels within units and/or removal from the treatment units. These treatments would involve a combination of mechanized equipment and handwork which would include falling trees for prescribed fire control line construction, arranging fuels within the units to facilitate future burning, or removing targeted fuels from the units where the transportation system allows.

The next phase would address the smaller (finer) fuels as well as the larger fuels where they remain in the units and exceed desired fuel loading, primarily in treatment units scheduled for mixed or low severity burning. Monitoring would be used to determine if objectives have been met with pile or jackpot burning or if portions of the unit would benefit from a broadcast burn. These treatments would be completed as scheduling and conditions (weather, fuel moisture, air quality, etc.) allow.

Concurrent with these treatments other necessary activities would occur such as road work, weed treatments, watershed improvement projects and livestock grazing rotation alteration. The location of landings, skid trails and prescribed fire control lines would be located on the ground during implementation. As discussed in design criteria, a Recreation Specialist would be consulted as appropriate during implementation.

As feasibility allows, implementation would be phased resulting in a short term disruption. However, it is anticipated that project implementation may take up to 15 years. Treatments could be visible for several years after implementation depending on treatment method.

The BLM would develop a separate implementation strategy separate from the Forest Service during layout and design for proposed activities on BLM lands. However, both agencies will coordinate activities to limit impact to affected resources.

Information Used

HLCNF Geographic Information System (GIS) data was used for analysis including recreation opportunity spectrum classes, and the project transportation layer, dispersed, and, developed recreation sites. Also, on-the-ground knowledge and experience of the Helena Ranger District and the Butte Field office of the BLM recreation managers were used.

Comments received during scoping were considered while refining the proposed action (alternative 2) and developing alternative 3. Scoping comments also influenced design criteria common to both action alternatives.

Recreation related issue statements from scoping comments that were considered in one of the alternatives or design criteria include:

- “Do not use non-motorized trails for mechanical entry in IRAs”.
 - Alternative 3 considers not using mechanical equipment in the IRA.
- “Do not convert trails into roads along Helena Ridge for mechanical treatments”.
 - Trails would not be converted to roads under either of the action alternatives. Trails used by equipment or motorized vehicle during implementation would be restored following use. See design criteria for more information.
- “Do not use Tr. #348 for mechanical entry into the IRA”.
 - Alternative 3 considers not using mechanical equipment in the IRA, including trail #348.
- “Do not conduct treatments along the CDNST”.
 - Alternative 1, the existing condition, does not conduct treatments along the CDNST. Design criteria were also developed for the action alternatives to address comments received regarding treatments along trails.

Analysis Area

The recreation analysis area is spatially defined as the project boundary. For the temporal bounds of the recreation analysis, short-term as well as long-term effects are considered. Short-term refers to those effects from the point of implementation up to three years. Long-term refers to those effects lasting more than three years. Project activities are anticipated to rotate across the project area for up to 15 years. Effects include disruption to recreation activities, setting and opportunities.

Methodology

Analysis was accomplished using local knowledge and relevant GIS data layers from the project's geodatabase: including trails, developed and dispersed roads, recreation sites, inventoried roadless areas, summer and winter Recreational Opportunity Spectrum (ROS) classes, winter use, and management areas. Using this information, the proposed activities' effect on the existing recreation condition was examined using qualitative and quantitative measurement indicators.

Miles of trail treated is used as a quantitative indicator to compare the affects to recreation resources. It is anticipated that treatment along trails within the project area would reduce the hazard of falling trees and in turn reduce the long-term need to clear trails of blowdown. In addition, qualitative considerations including activities, settings and opportunities are discussed for each alternative.

Incomplete and Unavailable Information

This analysis is using the most accurate and complete information available. We continue to learn more about the recreational uses occurring in the project area. Any new information we learn would be addressed and/or incorporated into this project as appropriate during planning and implementation.

Recreation, Affected Environment

Introduction

The following discusses the existing condition of recreation resources (activities, settings and opportunities) in the Tenmile – South Helena project area. The existing condition represents a basis for analysis when comparing the effects of the two action alternatives. Because proposed treatments have the potential to effect recreation resources, measurement indicators have been identified and are used to show the difference in effects between each alternative.

Project Area Recreation Activities

Statistics from the Forest's National Visitor Use Monitoring (NVUM) survey indicate that there are approximately 450,000 visits to the HLCNF annually. NVUM data further indicate that the majority of those visitors identify themselves as being from Lewis and Clark County. This indicates that the HLCNF is primarily a local destination with nearly 70 percent of visits come from people who live within 50 miles of the Forest.

Forestwide NVUM data found recreation visitors reported their primary Forest activity, at the following rates: hunting at 16.7 percent, hiking/walking at 11 percent, cross-country skiing at 10.7 percent, snowmobiling at 6.5 percent. In addition to the primary activity visitors also reported participating in the following activities, regardless of whether it is their main reason for visiting: hiking/walking at 31 percent, viewing natural features at 25.4 percent, and viewing wildlife at 21 percent.

Recreational trends and activities on BLM lands typically are similar to those on Forest Service lands since the two jurisdictions are adjacent to each other and in some cases, have trails that cross over both ownerships. This being said, the most popular activity to

occur on BLM lands tends to be hunting on those units located in the Colorado Gulch area. Single-track non-motorized use such as hiking and biking are more common in units where trails exist in the Grizzly Gulch area.

The common recreation activities that would potentially be temporarily affected by the Tenmile –South Helena Project include: hunting, camping, motorized and non-motorized trail recreation and travel on roadways to access the Forest for dispersed and developed activities.

Project Area Recreation Setting - Existing Condition

Recreational Opportunity Setting (ROS)

The Forest Service uses the Recreation Opportunity Spectrum (ROS) process to define recreation settings and categorize them into six distinct classes: primitive, semi-primitive non-motorized, semi-primitive motorized, roaded natural, rural, and urban. Similar to land use classifications (e.g., residential, industrial, rural) used in city or county planning efforts, ROS classes serves as a zoning framework for planning and managing recreation settings and opportunities, both existing and desired, across National Forest System Lands. Specific ROS classes convey: the physical setting, mode(s) of transportation, anticipated concentration of people, and levels of management and infrastructure. By identifying recreation settings, the Forests can ensure a sustainable set of recreation opportunities for future generations and visitors can select where they recreate based on what they want to do, what equipment they want to bring, and the type of experience they want. Table 203 defines the ROS classes and Figure 87 has a ROS map for the project area.

Table 203. ROS classes

Recreation Opportunity Class Spectrum	Definition
Primitive – Does not exist in Tenmile – South Helena Project Area	Describes large, remote, wild, and predominately unmodified landscapes. Areas with no motorized activity and little probability of seeing other people. Includes most Wilderness areas.
Semi-Primitive Non-Motorized	Areas of the Forests managed for non-motorized use. Uses include hiking and equestrian trails, mountain bikes and other non-motor mechanized equipment. Rustic facilities and opportunity for exploration, challenge, and self-reliance.
Semi-Primitive Motorized	Backcountry areas used primarily by motorized users on designated routes. Roads and trails designed for OHV's and high-clearance vehicles. Offers motorized opportunities for exploration, challenge, and self-reliance. Rustic facilities. Often provide portals into adjacent Primitive or Semi-Primitive Non-Motorized areas.
Roaded Natural	Often referred to as front country recreation areas. Accessed by open system roads that can accommodate sedan travel. Facilities are less rustic and more developed (campgrounds, trailheads, etc.). Often provide access points for adjacent Semi-Primitive Motorized, Semi-Primitive Non-Motorized, and Primitive settings.
Rural	Highly developed recreation sites and modified natural settings. Easily accessed by major highway. Located within populated areas where private land and other land holdings are nearby and obvious. Facilities are designed for user comfort and convenience.
Urban – Does not exist in Tenmile South Helena Project Area	Areas with highly developed recreation sites and extensively modified natural settings. Often located adjacent to or within cities or high population areas. Opportunities for solitude or silence are few.

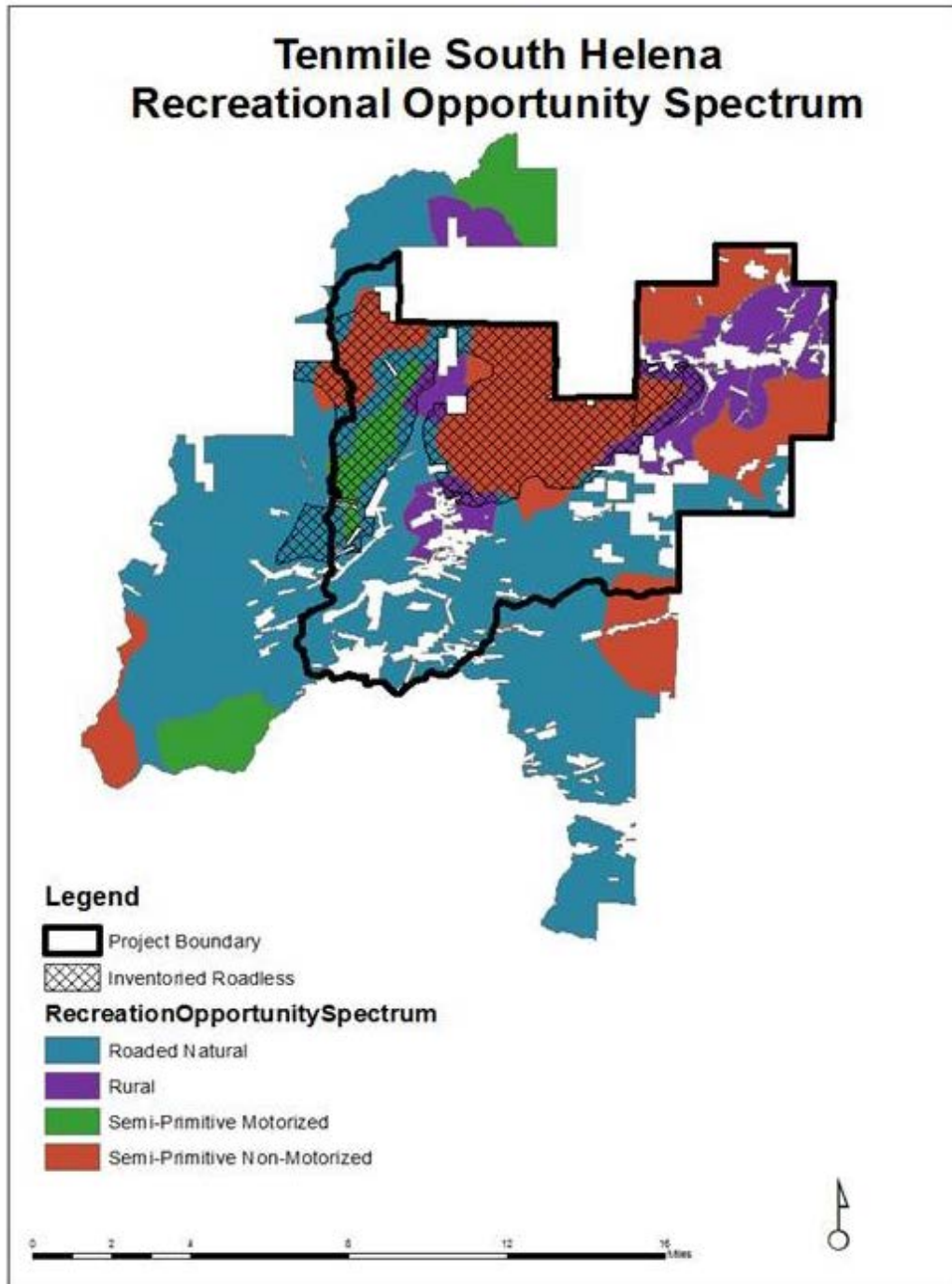


Figure 87. ROS within the project area; Jericho Mountain and Lazyman Gulch Inventoried Roadless Areas are delineated in crosshatch.

Tree Mortality

The forested portion of the project area has a high density of insect and disease caused mortality and these dead trees pose risk to recreationists. Within the project area, most roadsides and developed recreation sites have been cleared of hazard trees. However, hazard tree mitigation has not been completed on all trails in the project area. Many sections of trail have high densities of dead trees. In the project area it is common for fallen trees to obstruct travel and lead to the creation of detours or new bypass routes.

Please see the project Forested Vegetation and Fire and Fuels Specialist reports for detailed information on the forest and fuels condition in the project area.

Sections of the Continental Divide National Scenic Trail (CDNST) #337, Switchback Ridge Trail #348, and Tenmile Environmental Loop Trail #375 transect forest stands that have high densities of dead trees. The rate, at which the trees are falling, is exceeding trail manager's capacity to maintain an open trail corridor.



Figure 88. Forest Conditions along the CDNST south of MacDonald Pass

Trails

Generally, forested stands along the trail are dominated by lodgepole pine and Douglas-fir. Stands of lodgepole pine have been impacted by the Mountain Pine Beetle outbreak, resulting in dead trees falling across the trail that pose a hazard and impediment to trail users. It is frequently necessary for sawyers to cut out the trees that have blown down across the trail. This has resulted in a high density of cut trees lying immediately adjacent to the trail in some areas. The trails within the northeastern portion of the project area and closest to the City of Helena are referred to as the South Hills Trail System. Approximately 23 miles of trail are under Forest Service and BLM jurisdiction in this area. Many of these trails developed by users over time and were later adopted by the Helena Ranger District as system trails. They tend to follow developed infrastructure such as old roads and ditches. Planned trails have been added over time, taking advantage of ridges and other natural features to connect the trails and create scenic loop opportunities.

Outside the South Hills Trail System there is approximately 14 miles of system trail in the project area. This includes a portion of the CDNST #337, Switchback Ridge Trail #348, Tenmile Environmental Loop Trail #375 and a trail in the Brooklyn Bridge area.

The Continental Divide National Scenic Trail (CDNST) is located along the project's western boundary. It is one of 11 National Scenic Trails in the country, which required an act of Congress for designation. The section of CDNST between MacDonald Pass and FS road 1863 is non-motorized single-track.

The Switchback Ridge Trail intersects the CDNST. A short segment of the CDNST and the upper portion of the Switchback Ridge Trail are located on an old roadway. The route is closed to the public for motorized use however evidence of the historic motorized use is evident. Much of the CDNST in this area and the Switchback Ridge Trail are located within the Jericho Mountain IRA.

The Tennmile Environmental Loop Trail is in the vicinity and partially located along an existing road network. These roads are closed to the public for motorized use however the road prisms, as well as an area of extensive past ground disturbance are evident from the trail.

A segment of trail in the Brooklyn Bridge area is currently located on a closed road prism. The road, which the trail follows, is closed to the public for motorized use however it receives administrative use by the Forest Service. The Clancy-Unionville Vegetation Manipulation and Travel Management Project Record of Decision included that this road would be converted to a non-motorized trail. The need for administrative use on this road has diminished however removal of the road is being delayed while the potential for use to implement this project is considered. This road would allow for greater treatment opportunities and reduce the need for new temporary road. It is anticipated that this road prism would be removed when it is no longer being considered for use in this project or upon completion of its use to implement this project.

Inventoried Roadless Areas

The Jericho Mountain and Lazyman Gulch Inventoried Roadless Areas (IRA) are within the project area. These IRAs are mostly natural appearing with some evidence of human activity including scattered historic mining sites, cabins and roads. For additional information please see the Tennmile – South Helena Roadless Expanse Analysis report.

Project Area Recreation Opportunities

Dispersed Recreation

Dispersed camping is popular on riparian benches adjacent to creeks, as well as along the Continental Divide and in the Brooklyn Bridge area.

Cross country non-motorized travel, off trail, is also common, especially in parks along ridge tops. A few of the commonly used areas are listed below:

- Red Mountain and Red Mountain Flume
- Black Hall Meadows
- Lazyman Gulch
- Colorado Mountain (Moose Ridge)
- Minnehaha Railroad bed

- Various old flumes (water conveyance features)

Winter Recreation

During the early fall and winter, forest activities increase with the onset of hunting season and firewood gathering. After the hunting season, snowmobiling on both groomed and ungroomed routes is the primary winter activity with Nordic skiing and dogsledding use also occurring. Snowshoeing occurs primarily along the Continental Divide. The season of use is generally between December 15 and April 15. Grooming for snowmobile travel is only allowed after January 1 to minimize conflicts with wheeled vehicle uses associated with Christmas tree cutting, firewood gathering and other activities.

The South Hills of Helena receive year-round recreation use, in recent years the low snowpack has facilitated hiking and biking throughout the winter.

Motorized Recreation

All-Terrain Vehicles (ATV's), 50 inches or less in width, are allowed on the Lava Mountain Trail (only a small portion is located within the project area). In the winter FS road 527, the Minnehaha Road, is groomed for snowmobile travel by a local snowmobile club, the Helena Snowdrifters, for over-the-snow use in the winter months. This route connects with a larger network of groomed trails west of the Continental Divide outside the project area. Un-groomed routes are also located in the project area, such as in the Luttrell Peak area. These un-groomed routes connect to routes outside the project area. Roads in the project area also provide scenic driving opportunities yearlong.

Unauthorized motorized use is also known to occur within the project area. The Helena Ranger District is addressing these routes as they are identified. Currently, efforts are on their way to obliterate and restore unauthorized routes back to pre-disturb conditions. The high tree mortality has resulted in abundant personal use firewood cutting opportunities along road corridors in the project area. Firewood cutting has shown to contribute to initiating unauthorized route development as gathers' tend to drive off of designated routes in order to collect the firewood.

Primary Access Routes

Most recreation use is related and adjacent to Forest roads and/or trails. The primary access routes to the project area are from the following,

- Rimini Road, County Route 695, off US Hwy 12 (north)
- Grizzly Gulch, County Route 723, from downtown Helena (northeast)
- Orofino Gulch, County Route 454, from downtown Helena (northeast)
- Travis Creek (Unionville) Road, County Route 4000, from Interstate 15 (east)
- Corral Gulch, Forest Service Road 4009, from Interstate 15 (east)
- Continental Divide National Scenic Trail, Trail # 337 (north and south) along Continental Divide
- Telegraph, Forest Service Rd 495

- Access from the south and west is by secondary routes of varying development and maintenance levels.

Developed Recreation and Camping Sites

Several developed recreation sites are located in the project area:

- Moose Creek Campground
- Moose Creek Cabin
- Camp Rimini Snowmobile Parking Area
- Tenmile Day Use Area
- Davis Gulch Archery Range
- CDNST Trailhead and Scenic Vista on Macdonald Pass
- Quigley Day Use
- Park City Trailhead
- Moose Creek Villa Recreation Residences

There are also several less developed trailheads in the South Hills of Helena and along Rimini Road.

Non-Motorized Recreation

The entire South Hills trail system is non-motorized. The portion of the CDNST that is single-track, between MacDonald Pass and Road 1863, is non-motorized, as are the Switchback Ridge and Tenmile Environmental Loop Trail. There are approximately 39 miles of non-motorized trail within the project area.

Recreation, Environmental Consequences

Introduction

This section describes the environmental consequences of the no action alternative (alternative 1) as well as implementing the proposed action (alternative 2) and a third action alternative (alternative 3).

Measurement Indicator

Miles of trail treated is used as a quantitative indicator to compare the affects to recreation resources. It is anticipated that treatment along trails within the project area would reduce the hazard of falling trees and in turn reduce the long-term need to clear trails of blowdown. In addition, qualitative considerations including activities, settings and opportunities are discussed for each alternative.

Effects Common to All Action Alternatives

The action alternatives use similar types of vegetation treatments to meet the purpose and need for action. Acres and number of units by treatment type are displayed below in Table 204. There are differences between the two action alternatives: (1) Alternative 2 does not have acres of 'Low Severity Grassland Prescribed Fire' and (2) Alternative 3

does not have acres of ‘Seed Tree with Leave Trees’. Additionally, the two action alternatives differ by: (1) acres treated by treatment type; (2) location of treatment units; (3) specific treatment methods in Inventoried Roadless Areas; (4) the number of units; and mile of road treatment / decommissioning. Even with these differences, both action alternatives were designed to meet the purpose and need for the project. The overall effect on recreation resources would be similar. The extent of effects would be determined by the amount of treatment proposed in each alternative and are discussed in further detail below under effects to each action alternative.

Table 204. Comparison of vegetation treatment acreages and number of units for alternatives 2 and 3 on Forest Service and BLM Lands Combined.

Vegetation Treatment	Alternative 2 Acres	Alternative 3 Acres
Improvement Harvest	2,483	1,382
Clearcut with Leave Trees	3,573	2,348
Seed Tree with Leave Trees	298	0
Shelterwood with Leave Trees	363	102
Shaded Fuel Break	1,415	1,282
Low Severity Grassland Prescribed Fire	0	1,662
Low Severity Prescribed Fire	11,900	7,952
Mixed Severity Prescribed Fire	1,714	656
Private Land Buffers	2,091	2,283
Precommercial Thin	471	445
Total	24,308	18,112

Table 205. Comparison of road management for alternatives 2 and 3 (rounded to the nearest whole #)

Road Management	Alternative 2 (Proposed Action) (miles)	Alternative 3 (miles)
FS New Temporary Road Construction	39	21
BLM New Temporary Road Construction	4	3
Roads Decommission	15	15
Road Reconstruction	32	28
Road Maintenance	6	4

The below watershed improvement activities are also proposed under each action alternative. It is anticipated that these proposal would not have an effect on recreation resources because they would not result in the long-term changes in recreational activities, settings, or opportunities. However, there could be a short-term displacement in recreational activities as a result of road decommissioning and the re-route of road 299 during implementation. Decommissioning roads would also prevent future unauthorized motorized use into areas. Design criteria would be applied which would minimized this effect.

- Wetland restoration along forest road 299—will involve filling a drainage ditch to restore water level and some road reconstruction to provide better drainage control through the road (1700 feet of ditch filled, 25 acre wetland, up to 400 feet of road reconstructed).
- Road 299 re-routes—approximately 2000 feet of road would be relocated out of a wetland and onto a drier, low-gradient side slope.
- Road decommissioning—approximately 15 mile of road segments would be decommissioned, some prior to vegetation activities and some after completion of project activities.
- Westslope Cutthroat Trout restoration—in cooperation with Montana FWP, the project would remove non-native species above existing barrier structures in Moose Creek and lower Minnehaha Creek by mechanical methods such as electrofishing, and reintroduce native westslope cutthroat trout. The proposal implements guidance of the Montana Cutthroat Trout Steering Committee (MCTSC) and the intent of the memorandum of understanding (MOU) developed by its members, which included fisheries managers, conservation groups, tribes, and various industry concerns to ensure the long-term, self-sustaining persistence of westslope cutthroat trout within their historic range utilizing measures that include reestablishing non-hybridized populations where they have been extirpated (MCTSC 2007). No ground-disturbance would occur for this activity.

Project area recreation activities, setting and opportunities that are common to both action alternatives are described as follow.

Project Area Recreation Activities

The proposed vegetation treatments may directly affect recreation activities and visitor's experience in the project area. The treatments may require temporary road or trail closures or limited access to the immediate area for public safety. In addition, visitors may choose to avoid areas when operations are occurring, during hauling or periods of heavy traffic, or prescribed burning activities. These effects would be short term.

The project design criteria would minimize operations during hunting season and limit hauling on weekends and holidays and would therefore minimize impacts to the majority of recreational users. Public notification at trailheads, on Forest, and in the local media would allow adequate notice for those planning trips into the area to adjust their plans.

There would be short term effects to dispersed camping during operations but the more open forest conditions with a reduction in hazard trees may enhance opportunities for camping in the long term. Where haul routes pass through dispersed camping areas there would be a short term effect on the camping availability and experience. Design criteria are recommended to minimize impacts to dispersed camping opportunities.

Several of the groomed snowmobile routes have been identified as haul routes for the harvest activities. If winter operations are necessary, the Helena Ranger District would coordinate with the local snowmobile group, the Helena Snowdrifters and alternative routes may be identified for grooming.

Project Area Recreation Setting

The proposed vegetation treatments, mechanical and hand, may indirectly affect the recreation setting within the project area by changing the scenic qualities within the treatment areas. The treatments would reduce stand density and evidence of the treatment activity would be visible to visitors passing through the project area. These effects would be short term. In the long-term, proposed treatments would potentially result in a more diverse, resilient, and sustainable forest ecosystem. Green trees would also become established which would contribute to a more desired recreational setting.

The direct impacts to recreation setting from the mechanical activities would be to the sights and sounds of equipment, including chainsaws, feller bunchers, and cable yarding equipment within the mechanical treatment units, and log truck traffic on the haul routes. Indirect effects would result from changes to the scenery following the mechanical treatment activities, see the scenery specialist report. In the trail corridors, long term the setting would see a reduction in woody vegetation, including dead trees and a more diverse ecosystem.

Temporary roads built for project implementation would be removed after use and fully obliterated (see project design criteria for further details on temporary roads obliteration). Existing road prisms proposed to be used and decommissioned as part of this project would, in the long-term, improve the semi-primitive character in unroaded portions of the project area.

The direct impacts to recreation from the prescribed burning activities during project implementation would be the sights and sounds of forest workers and equipment, including chainsaws, vehicles and helicopters, along with periodic smoke emissions. Smoke emissions during the prescribed burns may have a direct affect to the quality of the recreation experience within the project area and in the adjacent dispersed camping areas by temporarily reducing air quality and visibility. Coordination with the Montana/Idaho Airshed Group and Montana Department of Environmental Quality to ensure compliance with the Clean Air Act would minimize this effect (additional discussion in the project's Air Quality Report).

Indirect affects to recreation would result from changes to the setting following the prescribed burning activities. There may be increased evidence of burnt trees in the trail corridors for several years following the prescribed burns when they are not removed or rearranged in advance. Recreational characteristics and aesthetic values would be given additional consideration in designing treatments along trail corridors.

Equipment trails (routes where mechanical equipment would travel), prescribed fire control lines and fuel reduction treatments would create openings that may become susceptible to unauthorized motorized use. Dense vegetation discourages unauthorized use and removing the vegetation or creating tracks may increase the susceptibility of the area to unauthorized motorized use. A similar effect is occurring in the project area currently, as a result of personal use firewood cutting and removal. Design criteria and monitoring are included to reduce the likelihood of unauthorized motorized use and trail creation.

Project Area Recreation Opportunities

A short term direct disruption of recreation use would occur during implementation but there would be no long term displacement of recreational use or reduction in opportunities in the project area. Long term treatment would reduce the amount of standing dead trees that would eventually fall. This would reduce safety concerns and obstructions to travel in treated portions of the project area, which would maintain or improve recreation opportunities.

Cumulative Effects

Analysis of cumulative effects on recreation considers the effects of past, present, and reasonably foreseeable future activities on the recreation resource. The spatial boundary for the actions considered in cumulative effects is the project boundary. The temporal bounds for the actions considered in cumulative effects are the same as described for the direct and indirect effects. For recreation, only activities within the project area could be expected to add to the impact of the project's activities. A list of these actions considered is provided in Appendix B of the Fisheries Report located in the project record. They include timber harvesting, prescribed burning, road and trail reconstruction, recreational use, mining, and other management activities.

Past development, mining, timber harvesting and road construction contributed to the existing condition of the recreation landscape, creating an area where human activity is evident, and the recreation setting is primarily that of a working landscape. In addition, past road construction has resulted in a positive contribution to the accessibility of recreation activities in the area, such as access to hunting grounds, dispersed campsites, and snowmobile routes. Trails improved over the past several years include sections of the CDNST.

Present and reasonably foreseeable future activities include continued maintenance on open forest roads, including improving road and surface drainage, clearing roadside vegetation, and repairing and maintaining culverts. When combined with the long term positive impact of the action alternatives on a healthy forest setting, present and future activities would have a positive effect on recreation by maintaining the access routes and improving the forest setting.

In summary, the cumulative impact of the projects listed in Appendix B of the Fisheries Report (located in the project record) would be neutral or positive for recreation.

Alternative 1: No Action

Measurement Indicators

Miles of trail treated: 0 miles

Direct/Indirect Effects

If alternative 1 is chosen, no vegetation treatments would occur. Consequently, dead trees would continue to fall in the project area and hazards would be addressed on a much smaller and site specific scale. It is expected that crews would continue to incrementally address hazards in high use areas. The frequent blowdown across trails would be

expected to continue. Over the long-term this alternative would result in the greatest exposure and workload for crews tasked with keeping trails open because this work would need to occur regularly for many years and would primarily be completed by hand. Over time there may be areas or trails where closures could be necessary if the hazard of falling snags increases and mitigation measures can't be taken.

Due to the high density of dead trees in some of the trail corridors in the project area, it is anticipated that simply sawing out trails, verses taking action to remove the dead trees and fuels from the corridors, would eventually result in heavy accumulations of slash and logs immediately adjacent to the trails. This generally reduces the scenic quality along the trail. The high tree mortality has reduced the scenic quality in the project area in general, which impacts some recreation experiences in the area, such as hiking or scenic driving on forest roads. Compared to the action alternatives, the consequence to recreation from not addressing at least some component of the dead trees would be negative in the long-term.

Compared with the action alternatives, this alternative would result in the least amount of short term disruption to recreation activities. Direct effects such as displacement of recreation uses to other areas during project implementation would not occur under this alternative. There would not be delays in driving forest road as a result of implementation. Hunters or other recreationists would not have to find other places to recreate when, for example, side roads that might access dispersed camping or hunting areas are temporarily unavailable due to operations. However, summer and fall disruptions to recreation access would result from not addressing the Mountain Pine Beetle outbreak and the associated fallen trees that a lack of treatment would produce.

Irreversible/Irretrievable Commitments

There would be no irreversible or irretrievable commitments with alternative 1.

Alternative 2: Proposed Action

Measurement Indicators

Miles of Trail Treated: Under this alternative 25 of the 39 miles of trail in the project area would be treated. See appendix A of the Recreation Report.

Direct/Indirect Effects

Project Area Recreation Activities

This alternative proposes to use the Brooklyn Bridge Trail, where it is currently located on a closed road, as a haul route. This would result in a short term displacement of recreation use. Following implementation this road would be converted to a single track trail.

More miles of trail would be treated under this action alternative than alternative three. Therefore in the long-term, there would be more hazard trees mitigated, resulting in less impediments for trail users and rendering it safer to recreational use.

Project Area Recreation Setting

Alternative 2 has more mechanical treatment proposed than alternative 3. Mechanical treatments offer more flexibility to rearrange or relocate larger fuels outside the trail corridor verses burning piles with heavier concentrations of fuels within the corridors. Where mechanical treatment activities occur within trail corridors there could be disturbance of the trail prism itself, which would be visible short term. Disturbance from mechanical operations along trail corridors is mitigated in design criteria.

In this alternative the potential for hazard tree removal along the CDNST would be 300 feet on either side of the trail's centerline. This alternative would allow for machinery to perform this work. The use of machinery would potentially allow for more undulation of unit edges, with the flexibility to tie into natural openings and enhance views outwards from the trail by removing dead trees. Machinery could also move the material further from the trail to burn it, reducing the need for piles and remnant burn scars adjacent to or within view of the trail.

Mechanical operation design and treatment prescriptions along the CDNST, Switchback Ridge Trail and Tenmile Environmental Trail could be further developed based on public comments on the Draft EIS and field review. Opportunities exist to consider different forms of mechanized treatments and restore areas showing evidence of past disturbance.

Project Area Recreation Opportunities

Recreation opportunities would not differ between action alternatives.

Irreversible/Irretrievable Commitments

If design criteria are followed, there would be no irreversible or irretrievable effects on the recreation resource as a result of this alternative.

Cumulative Effects

Cumulative effects to recreation would not change across alternatives and are discussed above in Effects Common to All Action Alternatives.

Alternative 3

Measurement Indicators

Under this alternative 23 of the 39 miles of trail within the project area would be treated.

Direct/Indirect Effects

Project Area Recreation Activities

Effects to project area recreation activities are addressed in Effects Common to All Action Alternatives above.

Project Area Recreation Setting

In alternative 3 more treatment would be completed by hand verses mechanical operations. The hazard tree treatment along the CDNST, 300 feet on either side of centerline, and Switchback Ridge would be completed using hand crews. Directional

falling of trees would be dictated by safety, tree lean, and, topography (machines might have more flexibility of where trees fall). Hand crews would potentially allow for less undulation of unit edges to tie into natural openings and enhance views outwards from the trail by the removal of dead trees. The larger diameter material would be difficult to move outside the trail corridor. Burning hand piles or jackpot accumulations, of larger diameter material, could result in burn scars being visible from the trail.

Project Area Recreation Opportunities

Recreation opportunities would not differ between action alternatives.

Irreversible/Irretrievable Commitments

If design criteria are followed, there would be no irreversible or irretrievable effects on the recreation resource as a result of this alternative.

Cumulative Effects

Cumulative effects to recreation would not change across alternatives and are discussed above under Effects Common to All Action Alternatives.

Conclusion

Under the no action alternative, summer and fall disruptions to recreation access would result from not addressing the Mountain Pine Beetle outbreak, and the associated fallen trees that a lack of treatment would produce. Under the action alternatives, a certain degree of temporary motorized vehicle travel restrictions or delays could be expected, primarily during the summer, fall, and winter. Under these alternatives, although access to recreation opportunities may be disrupted, the disruptions would be temporary, and would be the direct result of treatment implementation. The action alternatives could be expected to have a short-term negative impact in terms of displacement of hunting and winter motorized recreation opportunities in the project area, as a result of treatment implementation. Long-term, the action alternatives would have a positive impact on recreation opportunities by improving the recreation setting, safety along trail corridors, and reduce impediments caused by fallen trees.

Project Area Recreation Activities

Under the action alternatives, short term disruptions to recreation activities could be expected during implementation. Design criteria would be incorporated during project implementation to minimize this effect. Long-term, hazard trees along trails would be removed resulting in less impediment to trail users and would improve safety for forest visitors.

Project Area Recreation Settings

Under both action alternatives project implementation activities would have an impact on the recreation setting short term. In the long-term, proposed treatments would potentially result in a more diverse, resilient, and sustainable forest ecosystem. Green trees would also become established which would contribute to a more desired recreational setting.

Project Area Recreation Opportunities

During implementation of the action alternatives, recreation opportunities within the project area may be temporarily reduced. Long term it is anticipated that treatment of high mortality stands would have a positive effect on access to recreation opportunities.

Forest Plan and BLM RMP Consistency

The actions proposed by all alternatives are consistent with Forest Plan direction and standards and guidelines of the Butte Field Office BLM RMP. Therefore, the impacts of the proposed activities on the recreation resource would be consistent with Forest Plan standards and BLM RMP objectives because the actions proposed would result in long-term benefit to recreation resources. See appendix B of the DEIS for additional information on Forest Plan and BFO RMP consistency for recreation resources.

Visuals

Introduction

The Tenmile – South Helena project area covers a diverse landscape. Forest Service ownership has been fragmented with private inholdings. Recreation is a primary land use within the project area with destinations such as the Continental Divide National Scenic Trail, the South Hills Trail System, the Tenmile Environmental Unit, Tenmile Day Use Area, Moose Creek Cabin, Moose Creek Cabin, and, trail # 348- the Switchback Trail.

The effects of proposed action are analyzed for compliance with the 1986 Helena National Forest Plan and the Bureau of Land Management Butte Field Office Resource Management Plan. The plans designate Visual Quality Objectives (Forest Service) and Visual Resource Management Classes (Bureau of Land Management), guidelines for visually modifying the landscape, for both Management Areas and sensitive viewpoints. The project encompasses 12 different Management Areas and 10 sensitive viewpoints on Helena National Forest Lands. Bureau of Land Management lands span two Visual Resource Management Classes. Although not listed in the Helena National Forest Plan as a sensitive viewpoint the Continental Divide National Scenic Trail is also analyzed as a viewing platform, because of its special area designation.

Some potential effects of treatment activities could persist into the long term in areas with VQO's of Retention and Partial Retention on Helena National Forest lands. Because of this, implementation of portions of both of the action alternatives may require a site specific amendment to the 1986 Helena National Forest Plan (Forest Plan) for lands encompassed by the Tenmile - South Helena Project. The analysis concludes that both proposed action alternatives would comply with the BLM Butte Field Office Resource Management Plan.

Assumptions

The cycle of insect infestations is a natural process in the forested landscapes. This epidemic of insect infestation resulted in dead and dying trees or stands of dead trees across the Tenmile - South Helena (TSH) landscape. This is a component of those natural

processes that influence the overall vegetative mosaic and scenic characteristics. The FS Scenery Management System (SMS) recognizes natural disturbance processes such as fire, insects, and disease, to be part of the natural landscape and play an important role in maintaining healthy, sustainable, and scenic landscapes. These disturbance regimes are evaluated as part of an evolving landscape and can create positive changes to the scenic integrity of a landscape. A more diverse mosaic of vegetation, increased species diversity, and diversity of age classes are all potential results of natural disturbance processes that will be compared with positive attributes defined in desired landscape character descriptions.

There will be both short term and long-term effects to the visual quality. Short term effects are defined as those immediately following project implementation and lasting up to 5 years. Long term effects are those that occur after 5 years. Site –specific conditions (soils, slope, aspect, etc.) vary across the project area and will influence the timeframe in which visual impacts will diminish due to vegetation reestablishing.

All design criteria measures would be included as part of all action alternatives.

Information Used

The effects analysis is based on the project description, other specialist reports, map reviews, field observations, Google Earth simulations, GIS analysis, and, professional judgement of the Forest Landscape Architect. Landing locations have not been identified; however the majority of landings would occur along roads within the project area. Design features have been developed to address long term effects of constructed landings.

GIS data used for analysis was from the Tennmile - South Helena Project file geodatabase, including management areas and visual quality objectives, project transportation layer, and proposed alternatives with haul routes/ temporary road construction. Existing scenic integrity classes was extracted from a larger regional data set.

The following was used to establish a baseline for landscape character, http://www.epa.gov/wed/pages/ecoregions/mt_eco.htm - it contains ecoregion mapping and descriptions for the state of Montana.

Incomplete and Unavailable Information

The locations of landings were not available.

Methodology

This analysis was completed using the framework of the Visual Management System (VMS). VMS uses Visual Quality Objectives (VQO's) as standards and guidelines for managing scenic resources. The VQO refers to "degree of acceptable alteration of the characteristic landscape" (USDA Forest Service 1974, p. 46). The VQO is analyzed qualitatively using "degree of alteration" and "duration of impact" components from the "Visual Management System" (USDA Forest Service 1974, p. 28 and 30). In addition, degree of acceptable alteration is determined through the use of other agency handbooks, professional experience and judgment based on expected outcomes of similar activities elsewhere on the Forest. Field observations, existing scenic integrity, and, landscape

character were used to determine baseline existing conditions. As Forest Plans undergo revision, the VMS is being replaced with a newer Scenery Management System (SMS). Although not required by the Forest Plan, concepts relating to healthy ecological conditions and the interface with sustainable scenery are also considered.

Proposed treatment methods for specific species were analyzed to determine if the effects to scenic resources were compatible with the assigned VQOs and if any design features or mitigation measures were necessary.

VQO acres for the project area were determined using the Forest Plan Management Area direction in conjunction with sensitive viewing areas identified in appendix B of the Forest Plan. The Continental Divide National Scenic Trail is not identified in appendix B but included as a sensitive viewing area because of its national scenic trail designation. Management area VQOs are shown on Table 209. All sensitive areas considered when determining seen areas are listed in Table 206.

ArcMap, geographic information systems (GIS), was used to analyze the proposed activities in regards to visual quality objectives (VQO's). Distance zones (foreground, middleground, and background) from sensitive areas were mapped when determining seen areas. Seen areas from viewpoints were mapped with an ArcMAP viewshed analysis. The definition of seen area, for the purpose of this analysis, is an area mapped as potentially visible by the output of a viewshed GIS viewshed operation. This process uses a digital elevation model (DEM) to generate terrain. The DEM is a naked earth model- this operation doesn't account for the height and screening of vegetation, therefore visible areas in the GIS viewshed output are considered as possibly visible, not definitely visible.

If any portion of a unit is outputted as seen from the viewshed analysis, the whole unit was considered as seen. If a unit was seen in multiple distance zones, then the more restrictive VQO was used in the analysis.

In addition, key observation points were selected to do Google Earth simulations. To analyze visual impacts, photos were taken in popular travel corridors during site visits to areas where proposed treatments would be seen and concern levels were high. Photos were compared to visual simulations performed in Google Earth. Numerous viewpoints were reviewed to determine the short and long term impacts to scenery within the resource area.

Spatial Context for Effects Analysis:

The project boundary and the aggregated viewshed from the sensitive viewing areas, identified in Table 210, were used as the spatial bounds for determining direct and indirect effects for the analysis. This is the same boundary for cumulative effects analyses. The project area is approximately 61,395 acres.

Temporal Context for Effects Analysis:

Short-Term is 1 to 5 years. Long-Term is 6 years and beyond.

Scenery, Affected Environment

Introduction

This section discusses the effects to visual resources from the proposed management activities, and determine whether or not the project is compliant with Helena National Forest Plan visual standard and the Bureau of Land Management (BLM) Butte Filed Office Visual Resource Management (VRM) system. Baseline conditions for comparative purposes were determined by landscape Character, existing scenic integrity, where the activities are visible from, and, Forest Plan direction (VQOs).

Issue Indicator: Whether or not the Visual Quality Objectives of retention and partial retention would be achieved in the project area.

Analysis Area

The project boundary and the aggregated viewshed from the sensitive viewing areas, identified in

Table 206, were used as the spatial bounds for determining direct and indirect effects for the analysis. This is the same boundary for cumulative effects analyses. The project area is approximately 61,395 acres.

Table 206. Sensitive viewing areas.

Sensitive Viewing Areas	
Colorado Gulch Road	Ten Mile Picnic Area
F.S. Road #4000- (Unionville)	U.S. Highway 12
Interstate 15	Cromwell Dixon Campground
Moose Creek Campground	Park Lake and Campground
Mt. Helena Recreation Trail	Continental Divide National Scenic Trail
Orofino Gulch	

Landscape Character and Scenic Integrity

The project area is located west of the Continental Divide and south of Highway 12. It is approximately 61,395 acres in size and of mixed ownership. Table 207 lists the different ownerships and the amount in each category. While the ownership is mixed, the majority of land cover is influenced primarily by natural processes and therefore differentiation between the ownerships is not readily evident to the casual observer. This area of the HLCNF is the scenic backdrop and a primary recreational resource for Montana's capital city, Helena, other nearby communities, and, visitors to the area. The population of Helena is 29,596 (US Census, 2013). The small communities of Rimini and Unionville are inside the project area.

Table 207. Ownership in the Project Area

Ownership	Acres Within Project Area	Percent of Total Project Area (%)
Forest Service	49,543	81
Bureau of Land Management	1,043	1.7

Ownership	Acres Within Project Area	Percent of Total Project Area (%)
Private	10,007	16
Other	799	1.3
Total	61,395	100

While the project area has a rich history of prehistoric occupation, its signature on the landscape is not obvious. A legacy of mining has left behind a rich suite of structures, such as cabins and kilns, and, many identified mines, some of which are priorities for remedial action. Former mining communities were settled and have since been abandoned, leaving behind interesting clues of their heyday. Some riparian benches have been converted to pasture on private property, adding a rural setting in areas. Historically, fire was the primary disturbance throughout the area and would determine composition and patterns of vegetation. Parks are distributed throughout, such as Bullion Parks and Black Hall Meadows.

The Tenmile - South Helena (TSH) project area is a combination of ecoregions and characteristics. Mountains are rolling and rounded with little evidence of glaciation. The geology is diverse with mineral rich deposits of volcanic origin and sedimentary rocks. Patches of granite boulders and talus slopes are intermittent. The Continental Divide traverses the project's western boundary and is imbued with a microclimate (EPA ecoregions of Montana, 2015).



Figure 89. Granite Boulders with fall color along the Continental Divide.

Thick forests of subalpine fir and Douglas-fir climax habitat types, most of which are dominated by seral lodgepole pine, cloak higher elevations. An exception to this is the iconic Red Mountain, 8,143 feet; its upper slopes are conspicuously barren in spots exposing red, rocky soil. A stunted forest of wind-swept whitebark pine, clings to its round, flat ridge top. Forests are punctuated by wet, boggy habitats, such as Sure Thing

Swamp, that harbor unique communities of wet loving vegetation. Aspen stands are distributed throughout and give contrast to the expanses of conifers. Lower elevations, down to roughly 4,500 feet, have ponderosa pine that intergrade into grassland, mainly on south and southwesterly ridges.

Helena's primary water source, the Upper Tenmile Watershed, is located in the project area. Some waterways have been impounded to capture water for utility, such as Chessman Reservoir. Drainages are characterized as being heavily incised with constrained riparian areas such as Beaver Creek and Orofino Gulch. Some gulches have remnants of historic mining, such as kilns, that recall an era of fine craftsmanship.



Figure 90. Red Mountain seen from the Continental Divide Trail.



Figure 91. Bog with water loving plants.



Figure 92. Chessman Reservoir from the summit of Red Mountain.

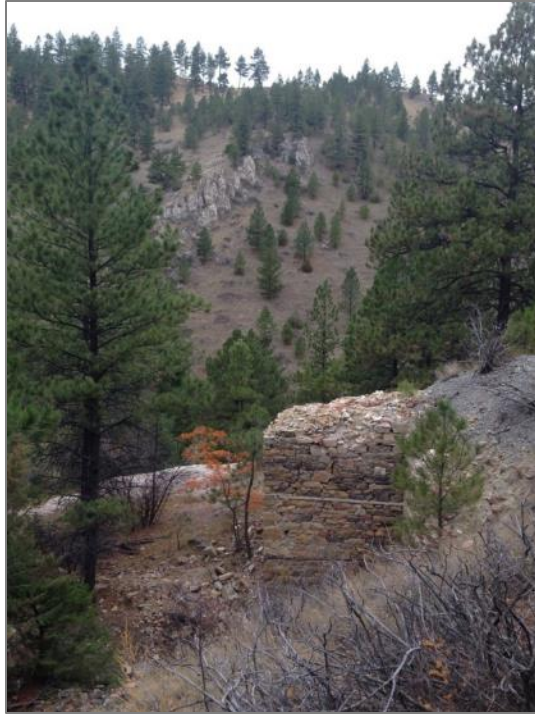


Figure 93. A historic kiln in Orofino Gulch.

Existing Condition

The TSH study area has been fragmented since euro-American settlement, starting with the discovery of its rich mineral deposits. Now, one can expect to find evidence of mining anywhere in the area. Many drainage bottoms have the rock-pile evidence of placer mining. High color contrasts of cut slopes, the effects of mining operations and road building, stand out from vegetation. Patented mining claims have created contrasting ownership patterns within the forest. Former timber harvests, utility corridors, and road building have imposed strong geometries on otherwise seemingly natural patterns of vegetation. Logging of hazard trees has left stark, straight line edges along road corridors that have received this treatment. Communication towers have been erected on prominent high points, such as those at MacDonald Pass.

Less obvious impacts to scenic integrity have also occurred. The exclusion of fire has changed vegetation composition and patterns, such as causing higher densities of trees than historic norms. It has also allowed for trees to encroach into areas that were historically mostly herbaceous vegetation.

Epidemic outbreaks of mountain pine beetle are currently the most noticeable impact to the landscape characteristics. In some portions of the project area, the beetle infestation has killed entire stands of trees. The insect epidemic has resulted in a large amount of dead gray trees throughout the landscapes of the project area. Reference the vegetation and fire sections of the assessment for more information.

Range allotments have necessitated the building of fences and water developments. The effects of grazing have simplified vegetation communities and impacted riparian areas.

Many trails have been constructed for recreation. Roads, initially constructed for resource extraction, now serve as the primary viewing platform for forest visitors.

Today, the predominant land uses are grazing, logging, mining (copper, zinc, lead, silver, and gold), wildlife habitat, recreation, and, residential housing.

Landscape Visibility

Landscape visibility addresses the relative importance of what is seen in the landscape. The TSH Project area is located west of Helena on the east side of MacDonald Pass and south of Highway 12. The project area's 61,395 acres render it visible from many locations; however, there is no centralized viewpoint to see the entire project area. Prominent views are seen from MacDonald Pass (Mac Pass) Vista Point, Highway 12 east of Mac Pass, the cross country ski trails at Mac Pass, the Continental Divide National Scenic Trail (CDNST) on the western project boundary, the MT Helena National Recreation Ridge Trail, and, from forest roads within the project area- to name a few.

Although much of the project area can be seen from these viewpoints, the Forest Plan visual quality objectives are based on the MA allocation. The HNF has identified several sensitive viewing areas across the Forest and listed them in Appendix B of the Forest Plan (USDA 1986). Ten of these sensitive viewing areas were included in this analysis: they are listed below. This analysis would address any changes to scenery from these viewpoints as well as the CDNST due to its national designation.

Sensitive Viewing Areas:

- F.S. Road #4000- (Unionville)
- Colorado Gulch Road
- Ten Mile Picnic Area
- U.S. Highway 12
- Interstate 15
- Cromwell Dixon Campground
- Moose Creek Campground
- Park Lake and Campground
- Mt. Helena Recreation Trail
- Continental Divide National Scenic Trail
- Orofino Gulch

Distance Zones

Landscape viewing can be subdivided into distance zones for classification, analysis, and simplification of inventory data. Distance zone categorization can be strengthened by relating it to perceivable landscape details that people relate to universally, such as leaf texture, tree limb patterns, landform configuration, and so on.

Table 208. Distance Zones

Zone	Distance
Immediate Foreground	0' to 300'
Foreground	300' to ½ mile
Middleground	½ mile to 4 miles
Background	4 miles to horizon

Visual Quality Objectives

Areas within the project that are assigned the VQO of retention are portions of the South Hills including the eastern slopes of Colorado and Black mountains, and, a relatively small area south of the Brooklyn Bridge road/trail. Areas within the project that are assigned the VQO of Partial Retention/Retention, are adjacent to MacDonald Pass, adjacent to the Rimini road around the Tenmile Recreation Complex, and, relatively small areas east of Colorado Mountain and west of Colorado Gulch. Areas within the project that are assigned the VQO Partial Retention are primarily located on the upper eastern flanks of Colorado and Black Mountains, and, scattered about northeast of Rimini Road. See Table 209 for the acres of Management Areas and assigned VQO's inside the project area.

Table 209. MAs and Associated VQOs

MAs	Acres	Percent of Total Project Area	Visual Quality Objectives
H1	14,292	23	Modification
H2	4,145	7	Modification
L1	1,532	2	Maximum Modification
L2	739	1	Modification
M1	7,486	12	Retention
R1	4,217	7	Retention
T1	9,059	15	Maximum Modification
T3	265	.84	Modification
T4	1,040	2	Partial Retention/ Retention
T5	5,263	9	Modification
W1	1,412	2	Partial Retention
W2	96	0.16	Partial Retention
Total – FS lands only	49,546	81%	

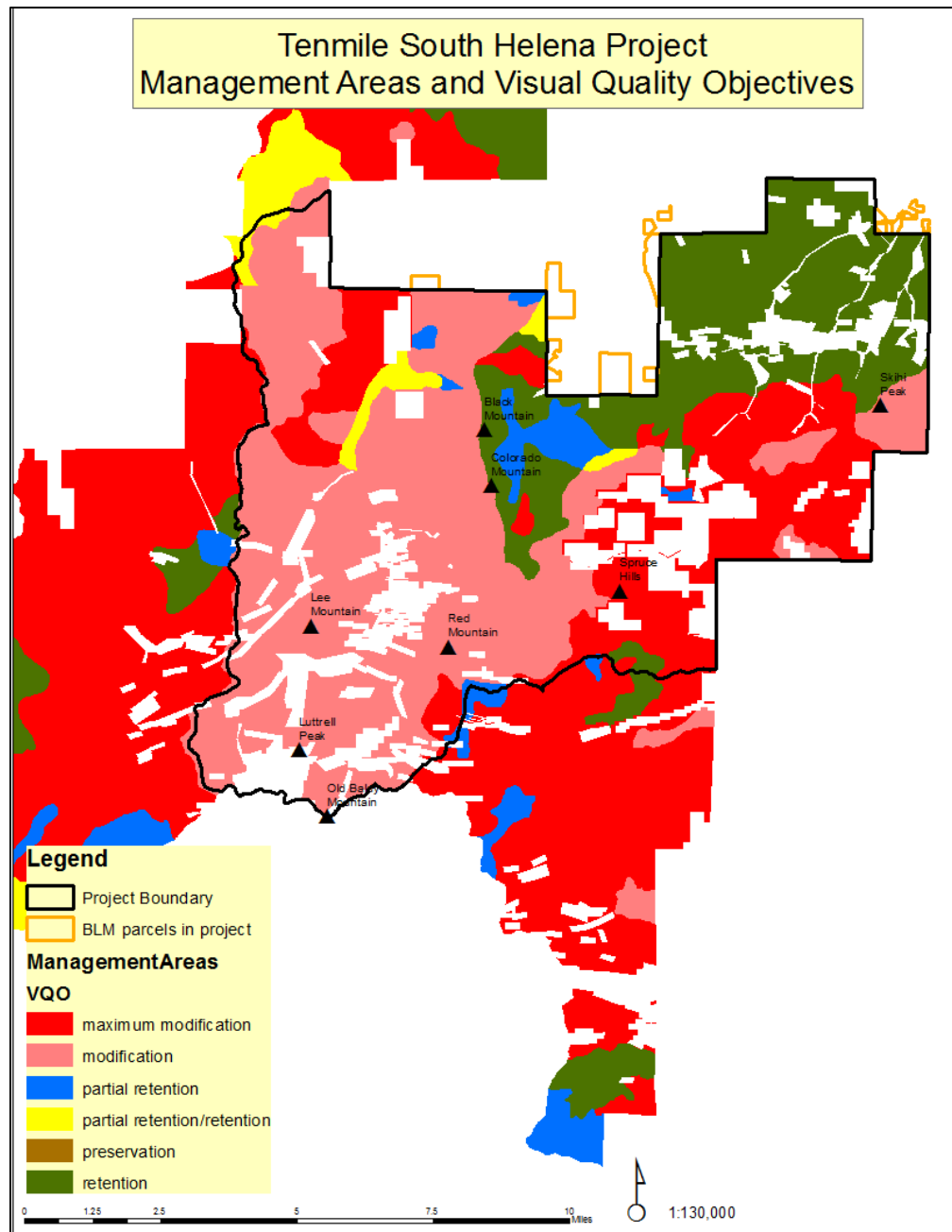


Figure 94. Tenmile – South Helena Project Management Areas and Visual Quality Objectives

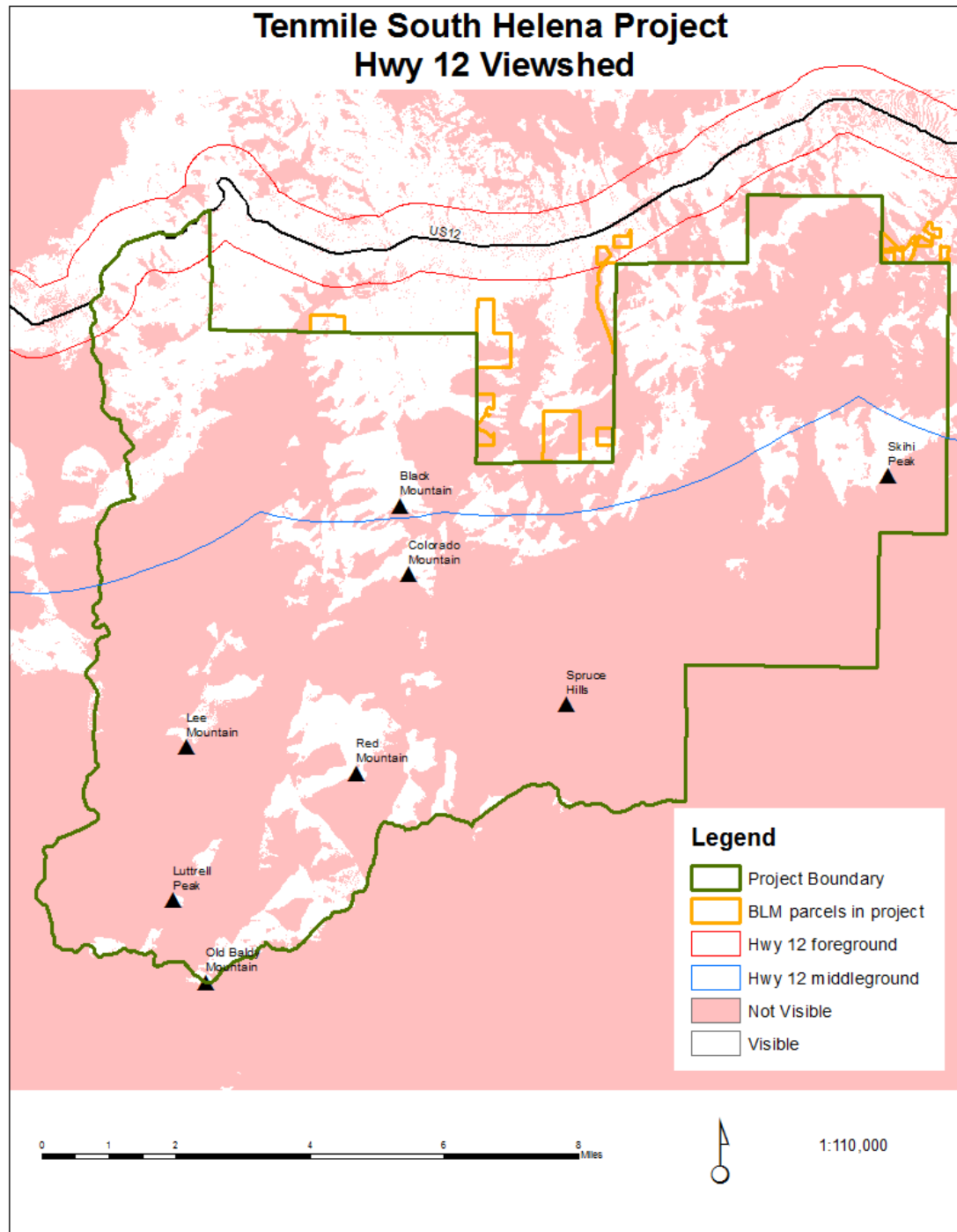


Figure 95. Highway 12 Viewshed.

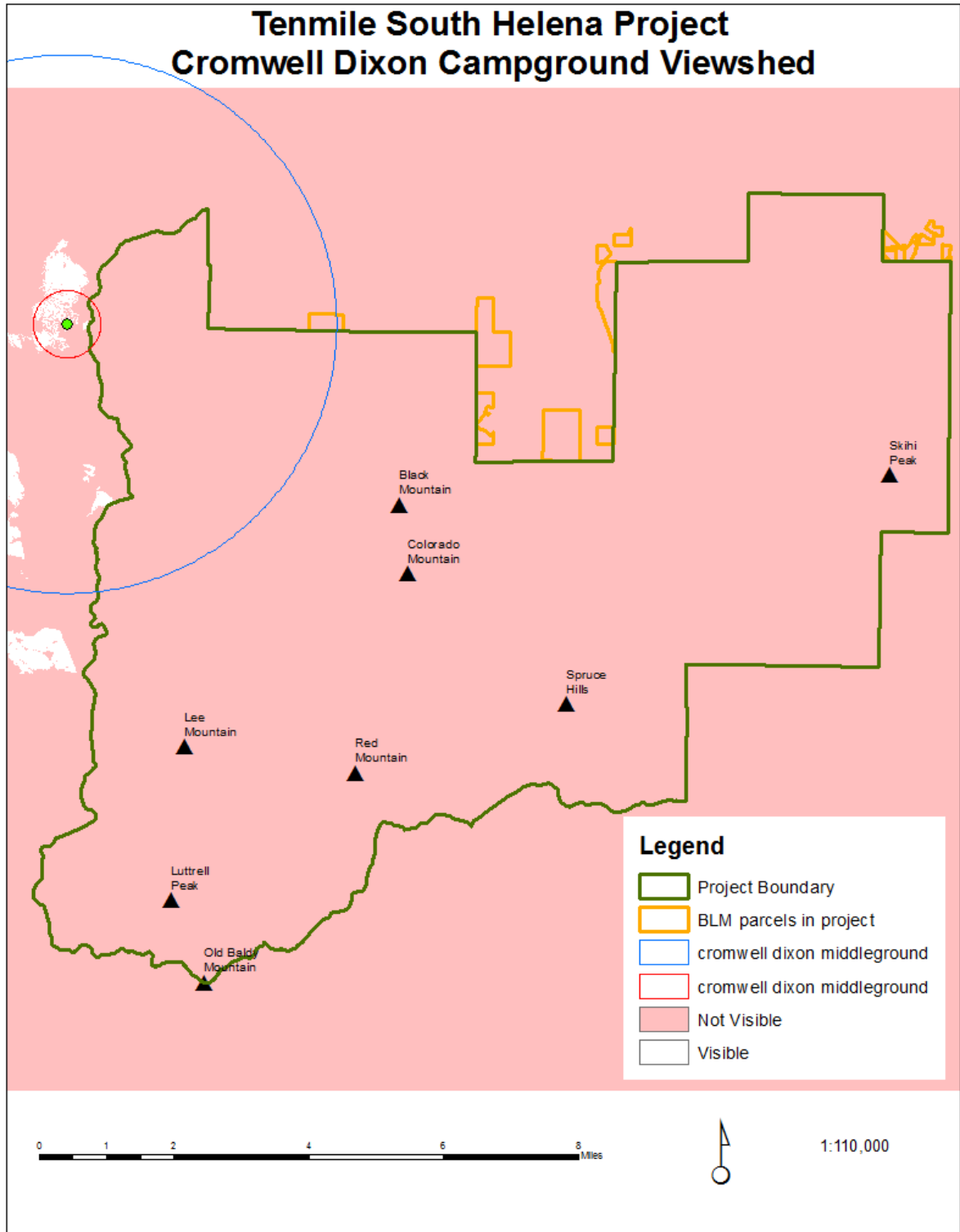


Figure 96. Cromwell Dixon Campground Viewshed.

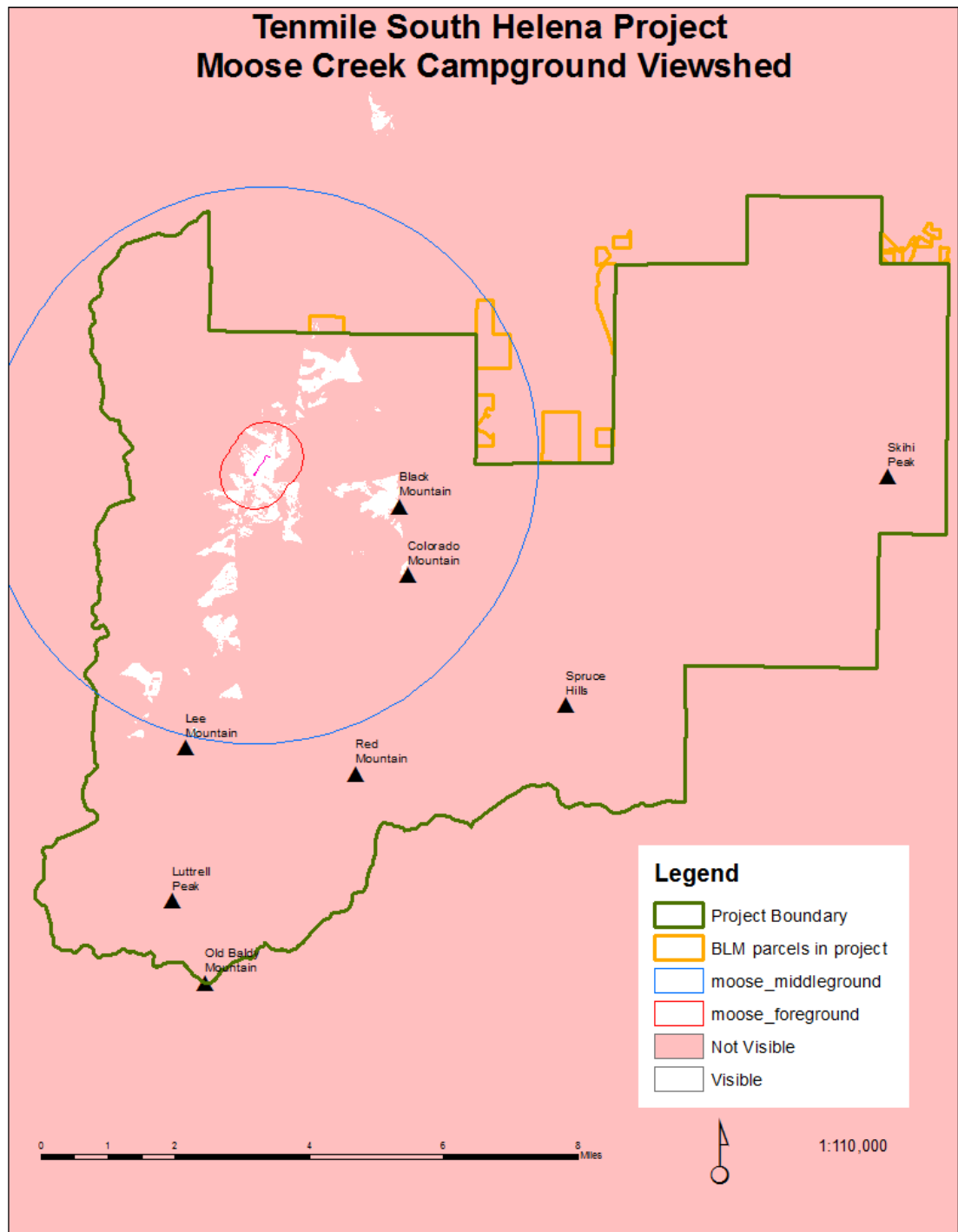


Figure 97. Moose Creek Campground Viewshed

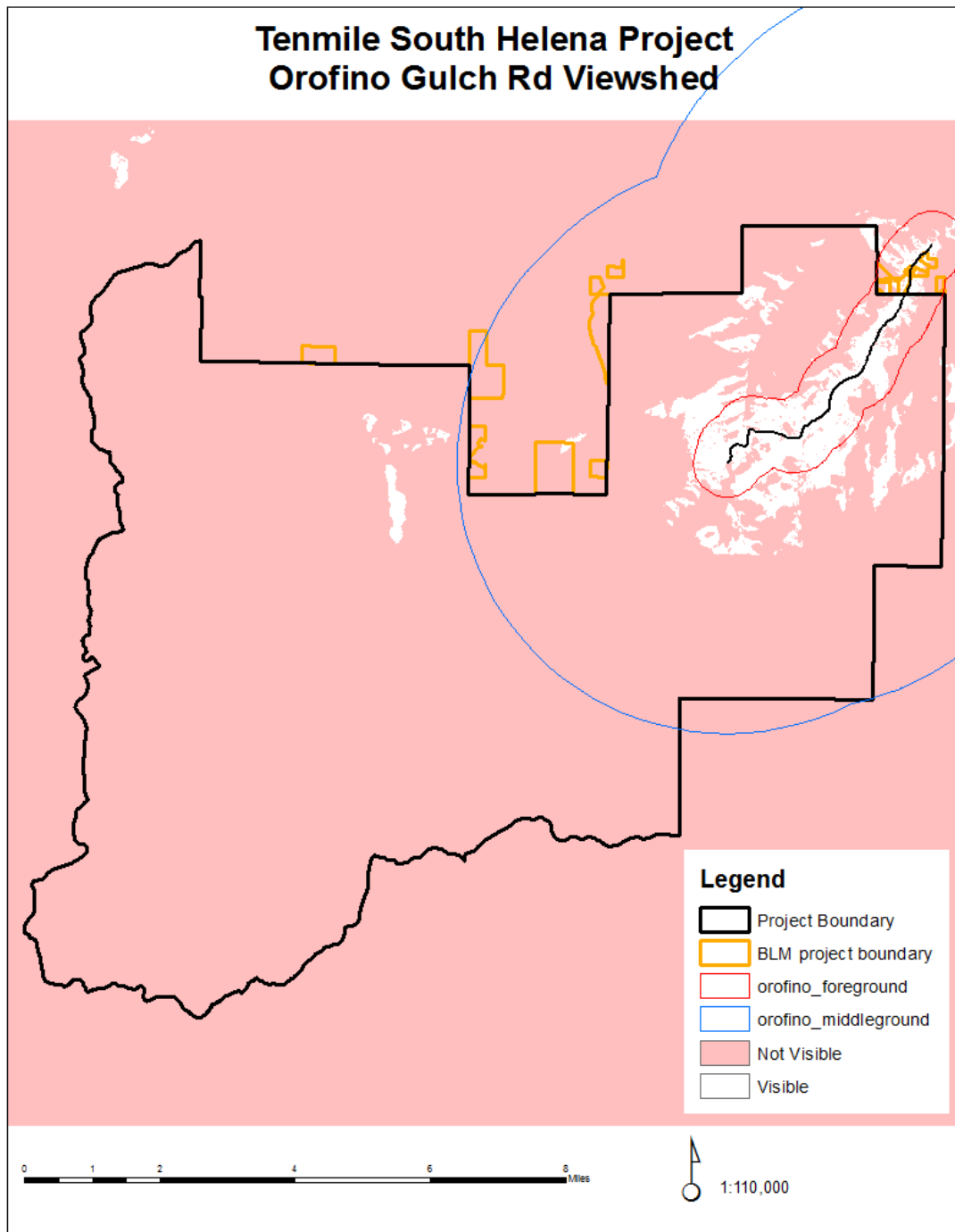


Figure 98. Orofino Gulch Viewshed.

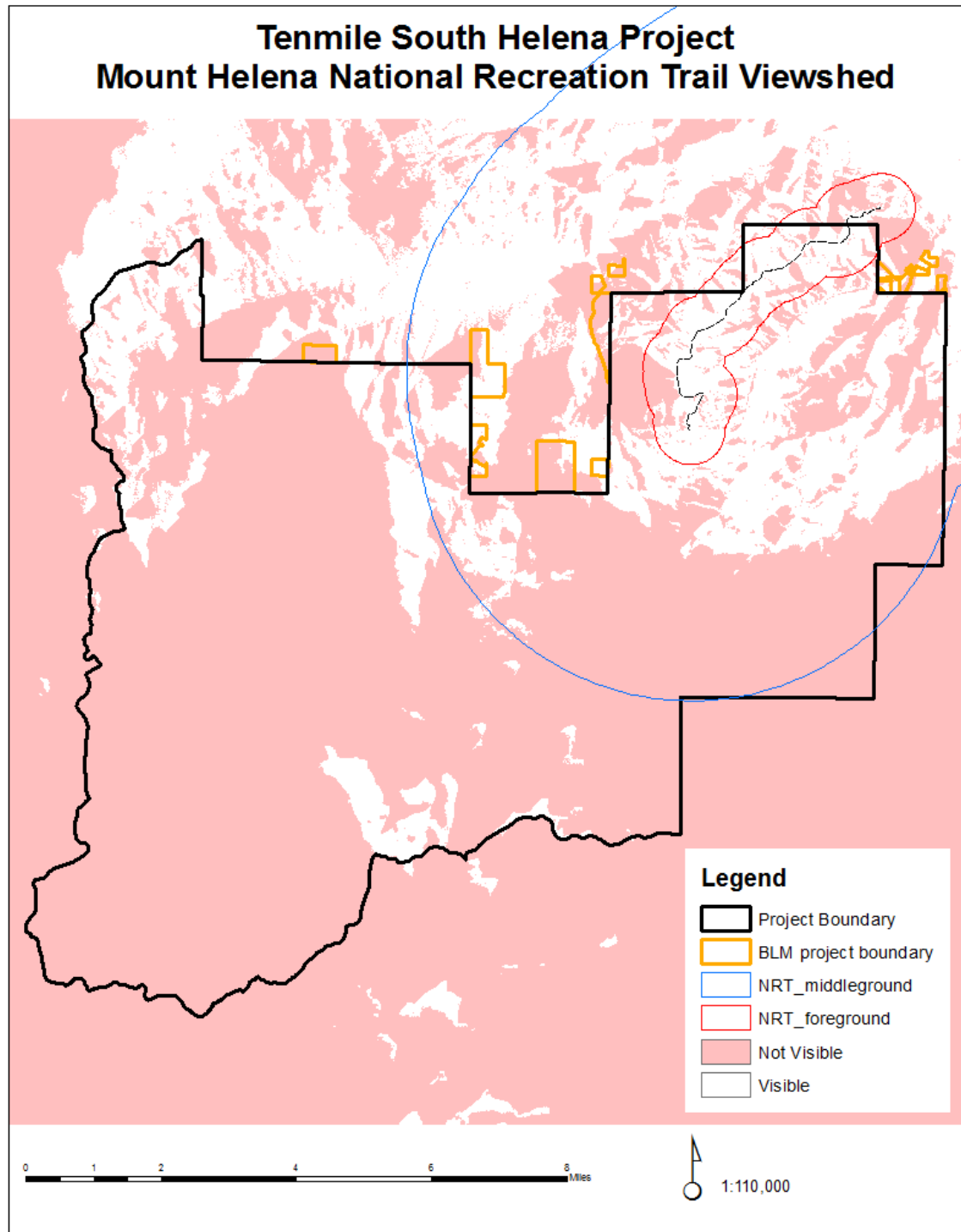


Figure 99. Mt. Helena Ridge National Recreation Trail Viewshed.

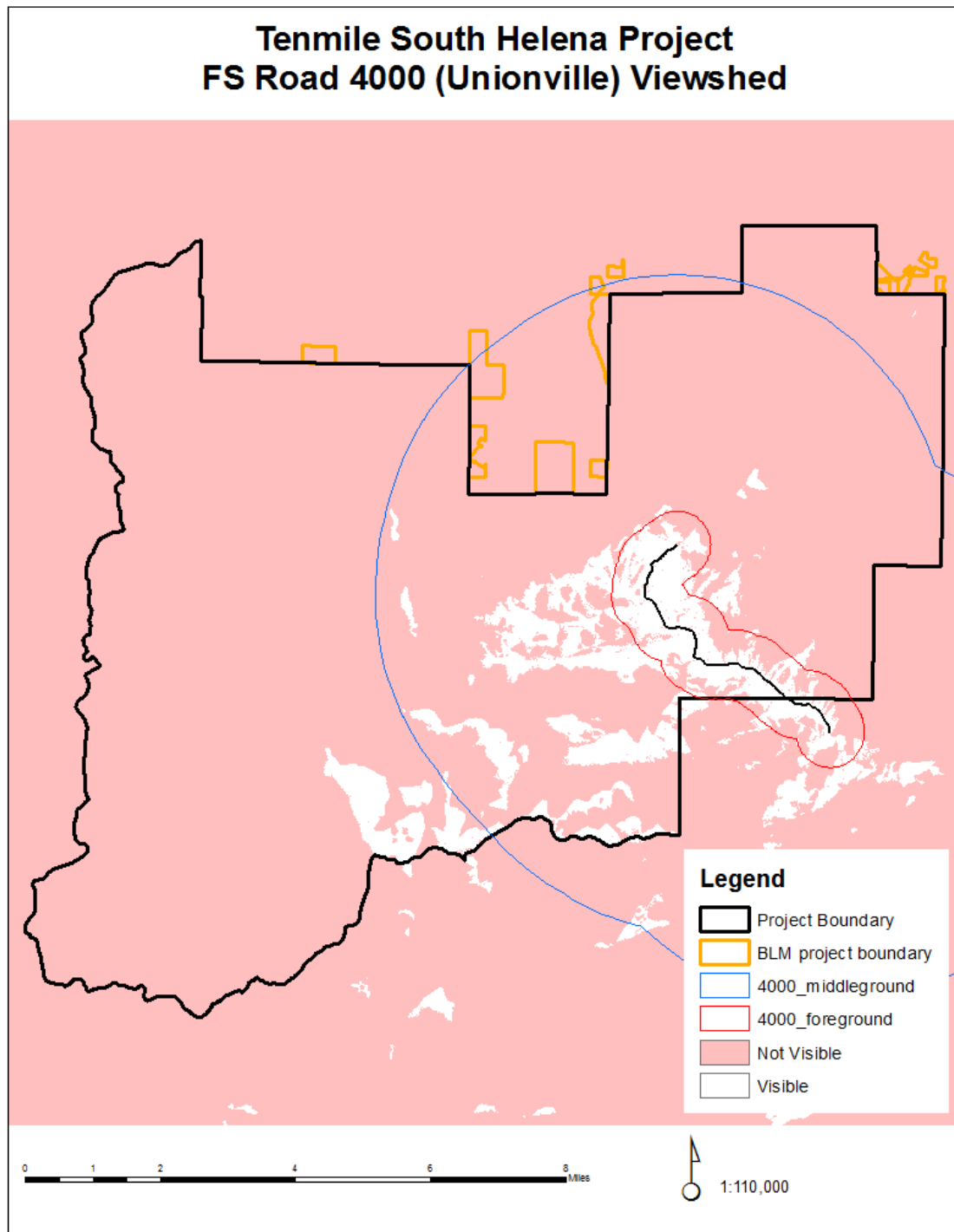


Figure 100. FS Road 4000 (Unionville) Viewshed

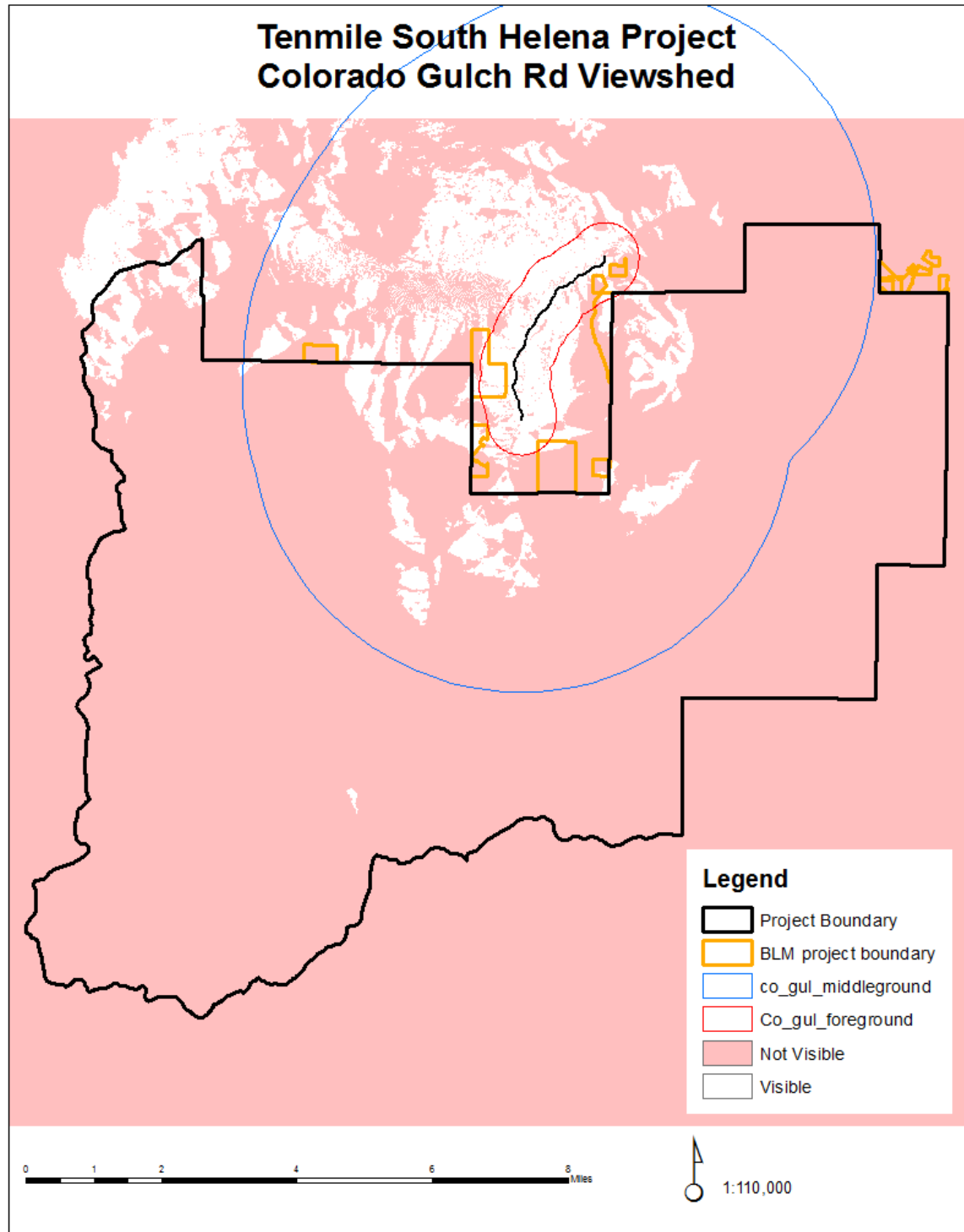


Figure 101. Colorado Gulch Road Viewshed.

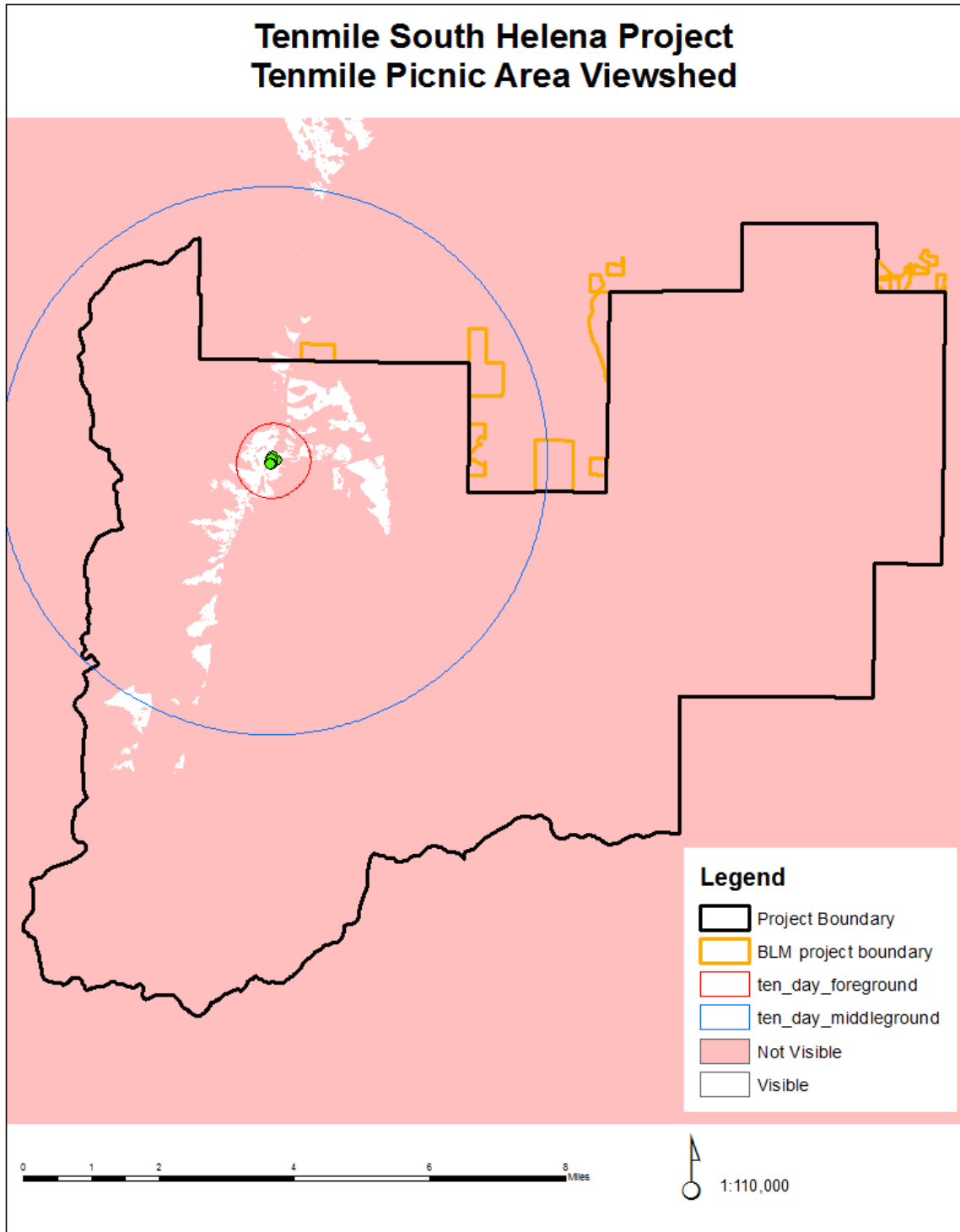


Figure 102. Tenmile Picnic Area Viewshed.

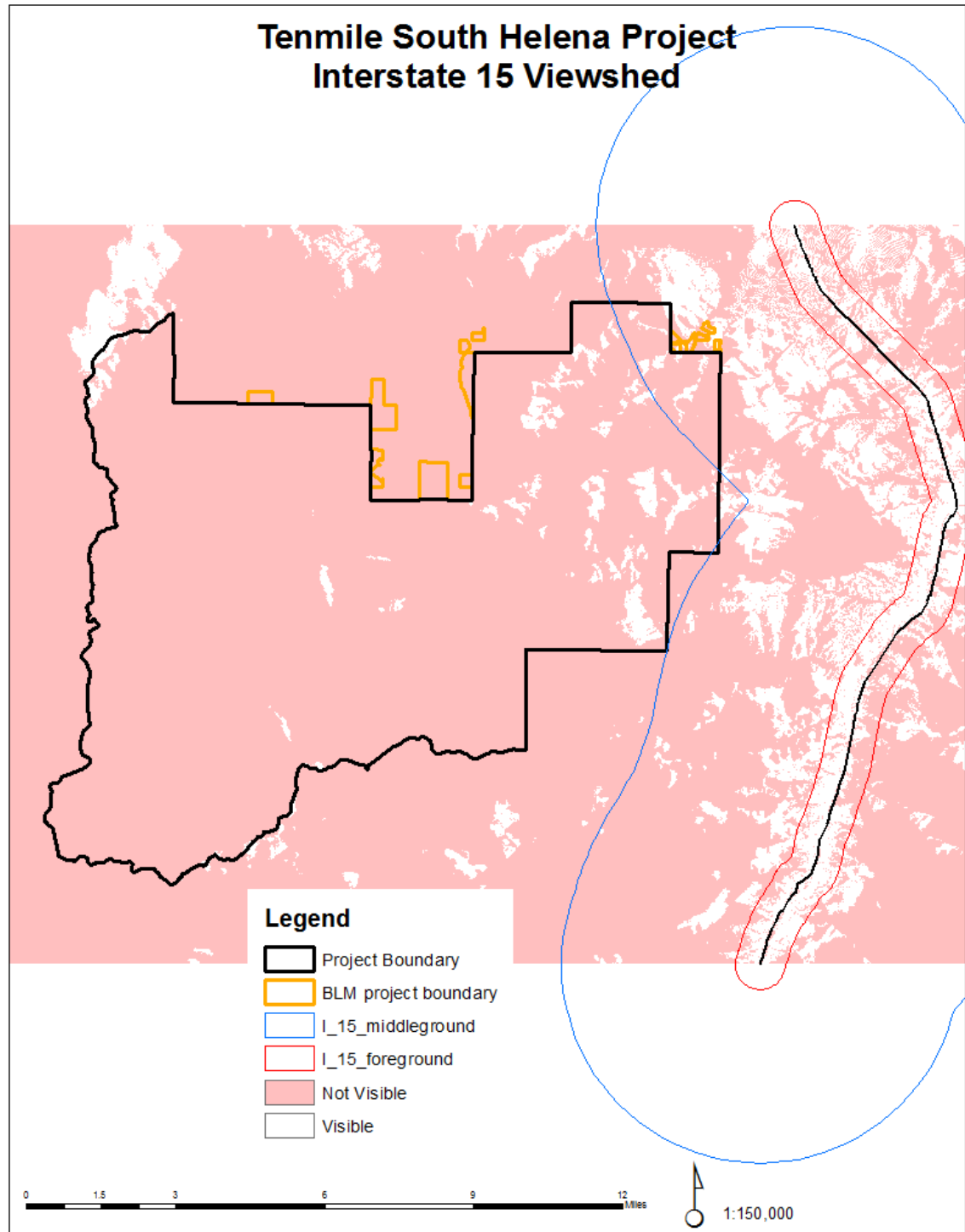


Figure 103. Interstate 15 Viewshed.

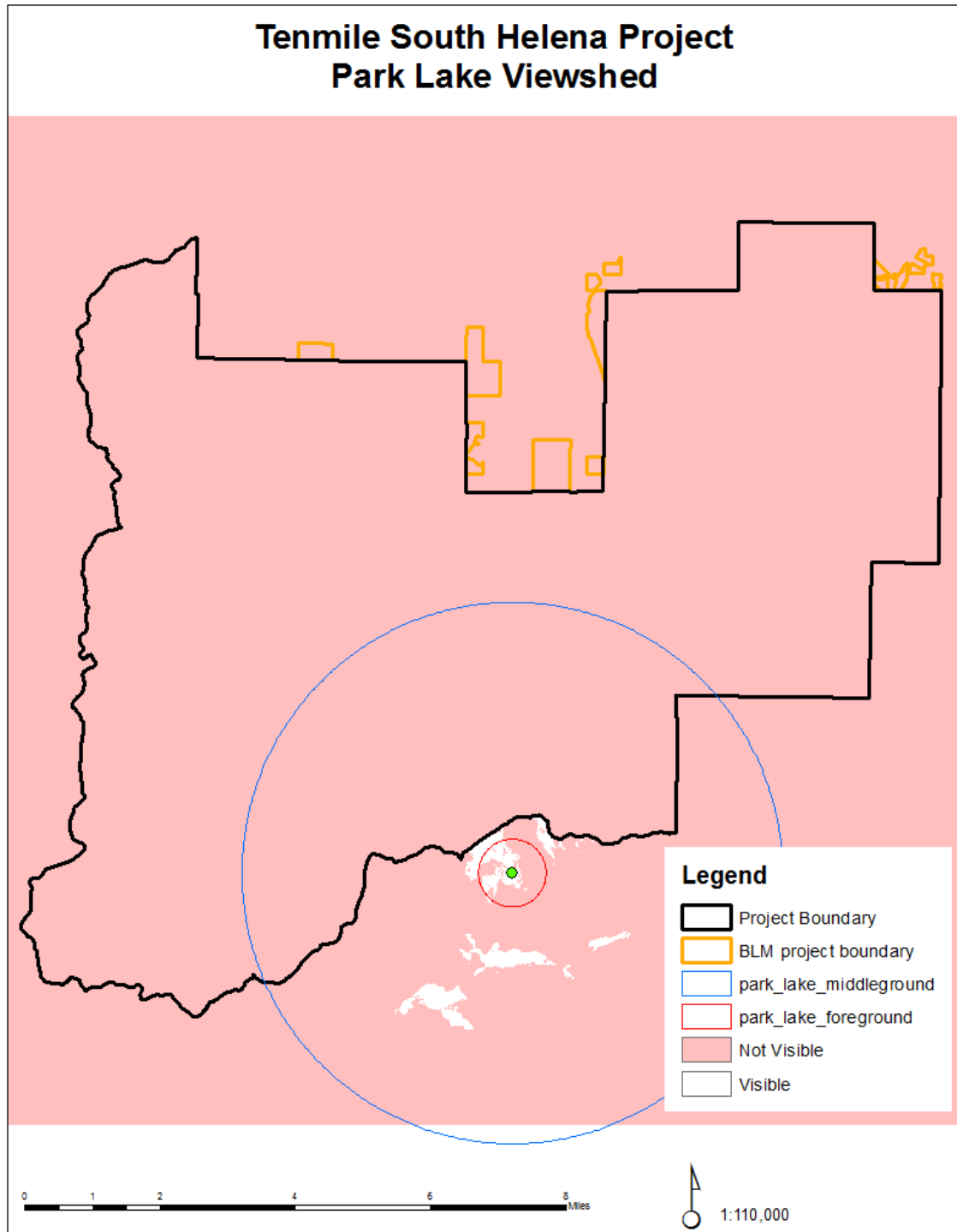


Figure 104. Park Lake Viewshed.

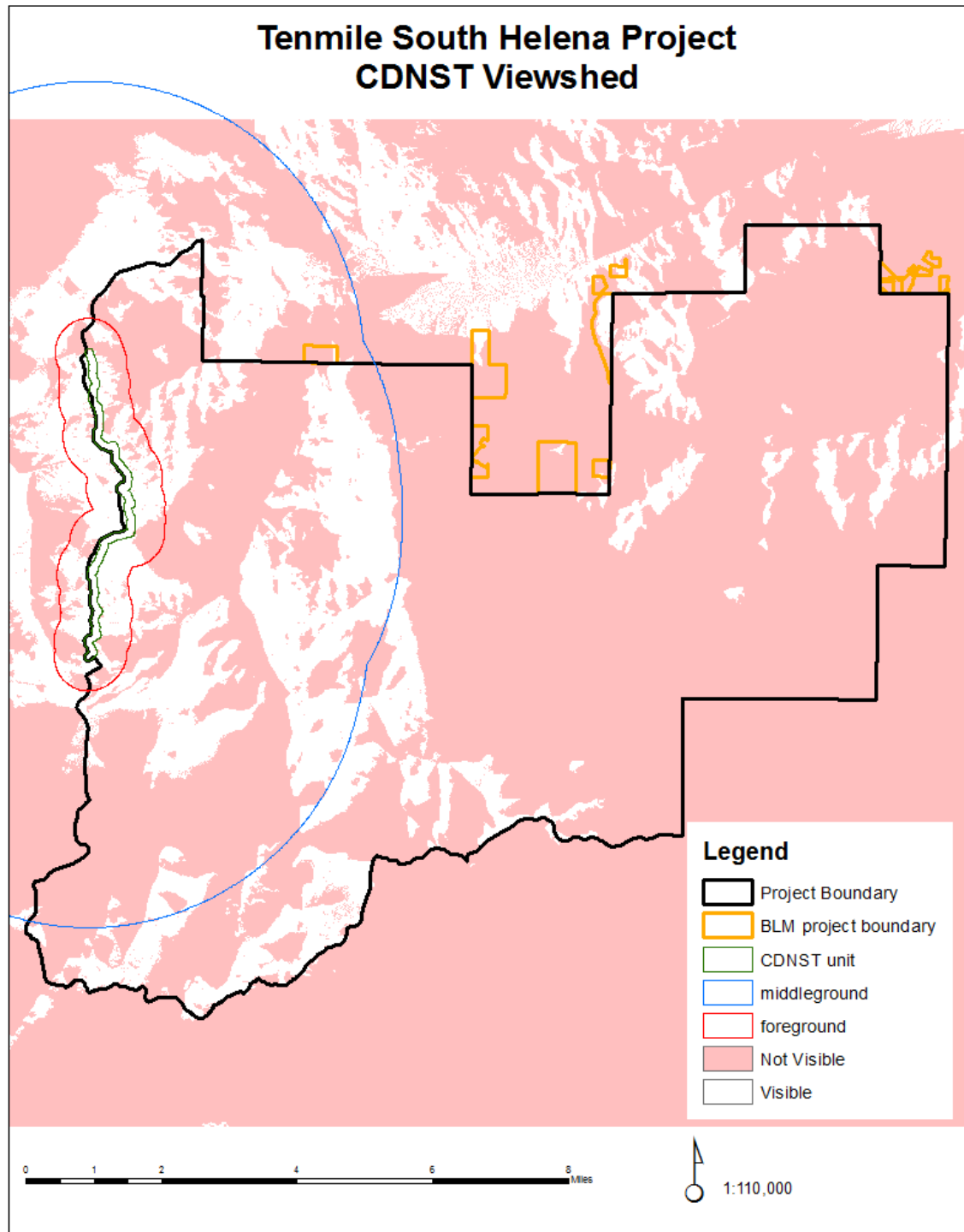


Figure 105. CDNST Viewshed.

Google Earth Simulations from Critical Viewpoints

As discussed in the methodology section, Google Earth is used to visualize units from various critical viewpoints. Figure 106 maps these viewpoints and a brief description follows.

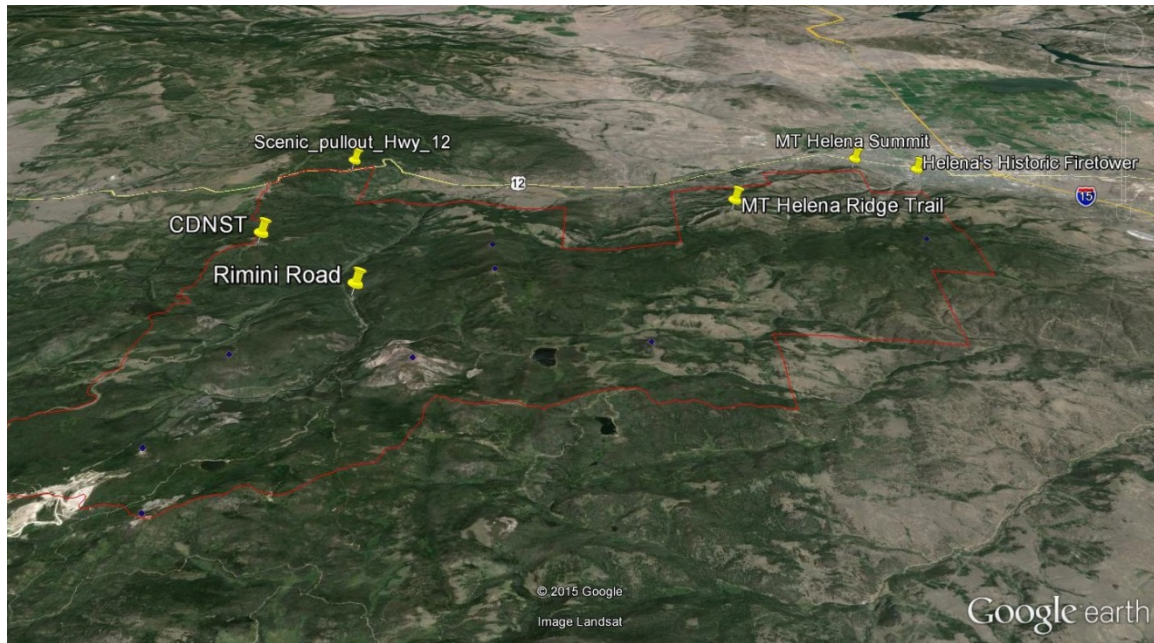


Figure 106. Critical viewpoints for the Tennile – South Helena Project.

Highway 12 Scenic Pullout

The scenic pullout on Highway 12 is a popular vantage as people ascend to MacDonald Pass from the east or descend from the west. The view extends south up the Tennile drainage towards Red Mountain. Views are in all three distance zones.

Continental Divide National Scenic Trail (CDNST)

The view chosen from this popular trail is from a prominent park that affords good vantages east into the project area. There are views in all distance zones.

Rimini Road

This view was selected to simulate what residences close to the town of Rimini would experience. The majority of views are in the foreground and middleground distances zones.

Mt. Helena Summit

The summit of Mt. Helena is a popular promontory that offers views south, east, and, west into the TSH project area. The summit is a part of a city park that abuts FS land and functions as one open space system. Views are in all three distance zones.

Mt. Helena Ridge Trail

This prominent view is located at a high point, close to the southern terminus of the Mt Helena National Recreation Trail. The vantage has expansive views into west, south, and, east portions of project area in all distance zones.

City of Helena's Historic Fire Tower

Located in downtown Helena close to the pedestrian mall, this high point is a popular destination. The historic fire tower has limited views into the southwestern TSH project area. Views of FS lands are in the middleground.

Scenery, Environmental Consequences

Introduction

The measurement indicators for Scenery are the Visual Quality Objectives from the Management Area direction, and from Forest Plan identified sensitive viewing areas listed in Appendix B. This is in accordance with the Visual Management System. In addition, there were other areas, both within the project area, such as the CDNST, and outside the forest boundary (critical view points from surrounding communities) that were used in assessing impacts to scenery.

Alternative 1: No Action

Alternative 1 is the no action alternative and provides the baseline for a comparison of the environmental effects of the two action alternatives.

There would be an increase in dead and dying trees. Effects of dead trees in the viewshed are added black lines in the landscape from the dead trees. Loss of these trees would equate to a decrease in the forest canopy followed by an increase in ground texture intermixed with the surrounding, remaining forest canopy leading to various size openings in the long-term. These effects would be noticeable in the foreground and middleground from sensitive areas by the casual forest visitor in the short and long-term. Down woody material would increase as dead trees fall, increasing ground fuel density. The increase in fuel density would increase the potential for these areas to experience more intense forest fires.

There would be no vegetation treatments or fuel treatments implemented for alternative 1. There would be no construction of landings or temporary roads built then obliterated in the project area or existing roads decommissioned.

Direct/Indirect Effects

Direct effects occur at the same time and place. Indirect effects occur at a later time or are farther removed in distance.

Under the no action alternative, the crowded, overstocked conditions in portions of the project area would continue. Continuation of overstocked conditions could maintain the rapid spread of insects, potentially causing additional mortality in the stand, heightening the risk of an intense wildfire. The vast stands of dead lodgepole pine detract from the scenic qualities of the landscape. Together, these elements would maintain the uncharacteristic vegetative mosaic across the landscape. If the vegetation is consumed by fire, or widespread insect infestations, the desired landscape character would be compromised.

Irreversible/Irretrievable Commitments

No irreversible or irretrievable commitments of scenic resources would occur because the characteristic landscape would be the prevalent landscape aesthetic.

Cumulative Effects

Anticipated trends include additional tree mortality, which would create a decline in the scenic characteristics of the project area.

Conclusions

Alternative 1 would be in compliance for visual resources. Visual quality objectives would be met for both the Forest Service and BLM since no management activity is proposed under this alternative. Changes would be from ecological processes.

Effects Common to Both Action Alternatives

The following effects to scenery by treatment type are discussed below. The descriptions don't take into account design criteria that will be implemented to mitigate impacts.

Treatments**Pre-commercial Thinning**

Marked trees for retention and unit boundaries may be visible in these units. The duration of impact could be more than five years until the marking paint fades.

Upon implementation of this activity a more open forest at the ground plane and in the mid to upper canopy could be expected to be viewed throughout these units. Remaining canopy cover would be less when compared to canopy cover prior to activity implementation. These effects would be expected to last more than 15 years but would not dominate the landscape. This activity borrows from other areas found in the landscape that are naturally established over time. The impact from the activity would not be expected to be noticeable by the casual forest visitor.

Prescribe fire (Low Severity and Mixed Severity)

Effects expected to potentially be viewed in the foreground are fire line boundaries and burned ground vegetation with some small pockets of tree mortality. Implementing the fire line boundary could add artificial lines. These boundary lines could look unnatural if straight lines and other geometric patterns are used during unit layout. The line/geometric effect could last more than a year until vegetation begins to grow and blend the unnatural lines into the landscape. The effects from the fire on the ground vegetation and tree mortality would not be expected to be discernable as a management activity by the casual forest visitor when compared to effects from other natural fires found in the landscape.

Regeneration Harvest**Clearcuts**

Marked trees for retention and unit boundaries may be visible in these units. However, the duration of impact could be more than five years until the paint used fades.

Clear cutting would create openings in the landscape. However, creating these openings could leave a wall of vegetation causing an edge effect that could be noticed by the casual forest visitor as an unnatural activity.

If an edge effect is created the duration of impact could last over 15 years.

Fuel treatment

Underburn

The effects expected to be viewed upon implementation of this activity in the foreground would be fire line boundaries and burned vegetation leaving some areas with little tree mortality. These effects would be similar to the effects described in the Prescribed Fire section for units viewed in the foreground.

Handpiling and Burning and Jackpot Burning

Handpiling and burning of the piles would be viewed in the foreground.

Piling the vegetation would add unnatural forms and texture to the landscape when viewed. However, these piles would be burned prior to the completion of the project allowing this effect to meet the duration of impact.

Upon burning, small pockets of tree mortality in close proximity to the burn piles and charred branches may be viewed from the implementation of this activity.

The small pockets of dead trees are not expected to dominate the landscape and might be viewed as part of a natural disturbance.

The charred branches left over from the burning of piles are expected to be viewed in the landscape. Within five years new vegetation could grow in, eliminating the possibility to view the burnt vegetation.

Burning of piles would add smoke into the air obstructing foreground and middleground views from sensitive areas. This effect would be short term and would subside upon completion of the burning activity.

Slashing

Foreground views along trails and roads would result in visible stumps that would persist until decayed or obscured by vegetation. If stumps aren't cut low and flush with the ground, they could attract the attention of the trail visitors. The higher the stumps are the more attention they will attract.

Logging systems

Hand (Chainsaws)

The use of chain saws is expected to leave cut tree stumps resembling light colored polka-dots visible in the foreground. This effect would be expected to last up to 5 years until the light colored portion of the stumps begin to fade away from weathering and blend into the landscape or obscured by vegetation.

Ground-based system

Effects from the use of a feller buncher and skidder could be viewed in the foreground.

Use of the feller buncher would cause disturbance of groundcover and shrubs when the feller buncher is driven over the landscape. However, these units would be burned eliminating this effect prior to completion of the activity.

The feller buncher could also leave cut tree stumps visible in the foreground similar to the polka-dot effect described in the use of chain saws. This effect would be expected to last up to 5 years until the light colored portion of the stumps begin to fade away from weathering or obscured by vegetation and blend into the landscape.

Skidder-Skid trails from the use of the skidder could be viewed in the landscape. If viewed, the effects would be unnatural lines, exposed soil causing a ground color contrast, and areas devoid of vegetation.

The unnatural lines, exposed soil, and bare ground effects would be expected to attract the a viewer's eye, and last for about two growing seasons until vegetation begins to grow and softens the visual color contrast.

Skyline (Cable)

The visible effect from this activity could be lines introduced to the landscape by the creation of the skyline corridors.

Transportation

There would be temporary road built then obliterated immediately following removal of fuels. In addition, there would be miles of system road that would be maintained for use.

Road decommissioning would have short-term effects of associated soil and vegetation disturbance but would become potentially less noticeable in the long-term.

Landings

The effects viewed from the creation of landings would be an edge effect created from the clearing of vegetation and an increase in texture on the ground in these openings due to the residual burnt branches. The edge effect could last for up to 15 years depending on the type of vegetation that is being cleared (i.e. trees verses shrubs or grasses). The increase texture from the burnt branches could last more than 1 year depending on how hot the ground burned and how long it takes native vegetation to fill in the area.

Alternative 2: Proposed Action

Alternative 2 is designed to maximize the opportunity to meet the purpose and need. Alternative 2 does this by proposing the largest number of acres treated, thereby providing the greatest change in fuel structures and creating large-areas of vegetation mosaics. The vegetation treatments which are common to both action alternatives are sorted into eight groups based on similarities in stand characteristics and treatments: Improvement Harvest, Regeneration Harvest, Shaded Fuel Break, Low Severity Prescribed Fire, Mixed Severity Prescribed Fire, Private Land Buffers, and, Pre-

commercial Thin. Descriptions of treatment types are discussed in the silviculture and fuels reports.

Direct/Indirect Effects

As described in the Affected Environment section, the TSH Project area is visible from many sensitive viewing areas including the CDNST. The effects of the proposed activities are described below for each sensitive viewing area and Management Areas with VQO's of Retention and/or Partial Retention.

Management Areas

The majority of acres that would be treated in MA's with VQO's of either, Retention, Partial Retention/Retention, and, Partial Retention, would have the treatment type of Low Severity Prescribed Fire. There would be many foreground views from trails and roads. Temporary road would be built. Improvement Harvest and other treatment types would occur in residential areas, such as around Cox's Lake. MAs with VQOs of Modification and Maximum Modification also have proposed units. There is the potential to see the linear effects of cable yarding.

Table 210. Alternative 2 units with treatment types and MA direction.

VQO	Treatment/Rx	Acres	Units
Retention	Low Severity Prescribed Fire	7,149	39a, 39f, 52, 53, 54, 55, 56, 57, 58, 59b, 59c, 60a, 60b, 61a, 62a, 62b, 63, 64a, 64b, 65, 66, 67, 68, 70, 86a, 86b, 87a, 88, 89a, 89b, 92a, 92b, 93, 96, 98a, 98d, 100b, 102, 103b, 107a, 107b, 107c, 113, 116a, 116b, 122a, 122b, 173b
	Mixed Severity Prescribed Fire	130	116i
	Shaded Fuel Break	492	90a, 173a, 145
	Pre-commercial Thin	8	132
	Regeneration Harvest	635	84b, 97a, 98g, 98h, 118
	Improvement Harvest	384	56a, 56b, 59a, 69, 71, 84c, 89c, 100a, 101, 102a, 103a, 106h, 112
	Private Land Buffers	458	72, 124a, 124b, 126, 156, 159, 160, 161
Partial Retention/Retention	Low Severity Prescribed Fire	1,255	8c, 8m, 8p, 116b, 141, 158
	Mixed Severity Prescribed Fire	612	116i
	Shaded Fuel Break	2,053	8k, 8n, 8q, 144, 173a
	Pre-commercial Thin	69	133, 134, 135
	Regeneration Harvest	43	39c
	Improvement Harvest	98	39b, 39h
	Private Land Buffers	53	159
Partial Retention	Low Severity Prescribed Fire	1,083	39,e, 39f, 39j, 39k, 39q, 39r, 39v, 116a, 116b
	Mixed Severity Prescribed Fire	–	–
	Shaded Fuel Break	–	–
	Pre-commercial Thin	40	22
	Regeneration Harvest	391	26, 118
	Improvement Harvest	137	39b, 39g, 39i, 39s, 39g
	Private Land Buffers	158	123a, 160

Highway 12

There would be a few units in foreground views including a private land buffer unit, which is directly next to Highway 12. A few BLM units would also be in foreground views with prescriptions of improvement harvest. The BLM visual resource management (VRM) class for these two units is class IV, which is defined in Table 211.

The majority of units that would be seen from Highway 12 are in the middleground distance zone. The prescriptions for most of the units on FS land are private land buffer, pre-commercial thinning, shaded fuel break, and, low and mixed severity prescribed fire. There are BLM units that would be visible in the middleground that have prescriptions of improvement and regeneration harvests. There would be temporary road visible as well. The VRM classes for these units are class III.

There would be limited background views of units on FS land. The prescriptions for these units are low severity prescribed fire, improvement harvest, private land buffer, and regeneration harvests. Some temporary road would be visible in the regeneration harvests.

Table 211. Alternative 2 units with treatment types in seen areas from Highway 12.

VQO	Treatment/Rx	Acres	Units
Retention (Foreground)	Low Severity Prescribed Fire	—	—
	Mixed Severity Prescribed Fire	—	—
	Shaded Fuel Break	67	144
	Pre-commercial Thin	—	—
	Regeneration Harvest	—	—
	Improvement Harvest	53	BLM 147, BLM 148
	Private Land Buffers	20	157
Partial Retention (Middleground and Background)	Low Severity Prescribed Fire	9,680	BLM 139, BLM 146, BLM164, BLM 165, BLM 166a, BLM 166b, BLM 169, BLM 170, 8d, 8f, 8i, 28, 37, 39a, 39d, 39e, 39f, 39j, 39k, 39l, 39m, 39n, 39o, 39p, 39q, 39r, 39u, 39v, 52, 53, 54, 55, 56e, 57, 58, 59c, 60a, 60b, 60c, 61a, 61c, 62a, 63, 64a, 64b, 65, 66, 67, 68, 70, 7a, 7c, 80, 86a, 86b, 87a, 87b, 88, 90b, 92b, 92c, 92d, 92d, 93, 102, 103c, 107a, 107c, 113, 116a, 116b, 116e, 116f, 116g, 122a, 122b, 122c, 141, 173b
	Mixed Severity Prescribed Fire	1,714	7b, 7e, 8b, 8h, 8j, 8l, 8o, 116c, 116h, 116i
	Shaded Fuel Break	1,415	7d, 8a, 8g, 8k, 8n, 8q, 90a, 144, 145, 173a
	Pre-commercial Thin	179	6, 40, 41, 131, 135, 137
	Regeneration Harvest	2,139	BLM 143a, 1, 5, 11, 23, 24, 26, 27a, 27b, 27c, 29, 36, 39c, 106a, 118, 130

VQO	Treatment/Rx	Acres	Units
	Improvement Harvest	757	BLM 140, BLM143b, BLM 171, BLM 172, 39b, 39g, 39i, 39s, 56a, 69, 102a, 103a, 106b, 106h, 117
	Private Land Buffers	1,657	72, 124a, 124b, 126, 127g, 127h, 127i, 127k, 127n, 127q, 128, 129a, 129b, 129c, 129d, 129e, 149, 156, 157, 159, 160

Moose Creek Campground

The immediate foreground view in this developed recreation site was already treated for hazard trees and therefore mostly devoid of trees. Foreground views that would result from this project, would have units with prescriptions of shaded fuel break, low severity prescribed fire, and, private land buffer.

Middleground views would contain units with prescriptions of shaded fuel break, private land buffer, low severity prescribed fire, and, regeneration harvest with temporary roads.

Background views would be limited with only glimpses of units with pre-commercial thinning and private land buffer.

Table 212. Alternative 2 units with treatment types in seen areas from Moose Creek Campground.

VQO	Treatment/Rx	Acres	Units
Retention (Foreground)	Low Severity Prescribed Fire	792	8c, 8m, 8p, 141, 158
	Mixed Severity Prescribed Fire	–	–
	Shaded Fuel Break	300	8a, 8k, 8n
	Pre-commercial Thin	–	–
	Regeneration Harvest	–	–
	Improvement Harvest	–	–
	Private Land Buffers	120	149
Partial Retention (Middleground and Background)	Low Severity Prescribed Fire	1,584	8i, 37, 39a, 39e, 39f, 39j, 39k, 39l, 39m, 39n, 39o, 39q, 39r, 39u
	Mixed Severity Prescribed Fire	587	8l, 116c
	Shaded Fuel Break	187	8q
	Pre-commercial Thin	37	34
	Regeneration Harvest	569	11, 39c
	Improvement Harvest	52	39g, 39i, 39s
	Private Land Buffers	254	129c, 153

Tenmile Picnic Area

The immediate foreground view in this developed recreation site was already treated for hazard trees and therefore mostly devoid of trees. Foreground views that would result from this project, would have units with prescriptions of shaded fuel break, low severity prescribed fire, and, regeneration harvest with temporary roads, and, improvement harvests.

Middleground views would contain units with prescriptions of shaded fuel break, low severity prescribed fire, pre-commercial thin, regeneration harvest with temporary roads, and, improvement harvests with temporary roads.

Background views would be limited with only glimpses of units with pre-commercial thinning, low severity prescribed fire, and, private land buffer.

Table 213. Alternative 2 units with treatment types in seen areas from Tenmile Picnic Area.

VQO	Treatment/Rx	Acres	Units
Retention (Foreground)	Low Severity Prescribed Fire	540	8c, 8i, 39e, 39u, 141, 158
	Mixed Severity Prescribed Fire	—	—
	Shaded Fuel Break	123	8a
	Pre-commercial Thin	54	41, 133
	Regeneration Harvest	43	39c
	Improvement Harvest	118	39b, 39h, 39s
	Private Land Buffers	120	149
Partial Retention (Middleground and Background)	Low Severity Prescribed Fire	1,893	8p, 8m, 37, 39a, 39e, 39f, 39k, 39j, 39k, 39l, 39m, 39n, 39o, 39q, 39r, 39v
	Mixed Severity Prescribed Fire	657	8g, 8k, 8n, 8q
	Shaded Fuel Break	488	8q
	Pre-commercial Thin	36	34
	Regeneration Harvest	553	11, 33
	Improvement Harvest	26	39i
	Private Land Buffers	33	153

Mt. Helena National Recreation Trail

Foreground views would have units with prescriptions of low severity prescribed fire and improvement harvest.

Middleground views would contain units with prescriptions of shaded fuel break, low and mixed severity prescribed fire, pre-commercial thin, regeneration harvest with temporary roads, improvement harvests, and, private land buffer.

Background views are limited and are of units with pre-commercial thinning, mixed severity prescribed fire, private land buffer, shaded fuel break, and, regeneration harvests with temporary road.

Table 214. Alternative 2 units with treatment types in seen areas from Mt. Helena Ridge Trail.

VQO	Treatment/Rx	Acres	Units
Retention (Foreground)	Low Severity Prescribed Fire	4,942	65, 67, 68, 70, 86a, 86b, 87a, 87b, 88, 92a, 92b, 92c, 92e, 92d, 93, 100b, 102,
	Mixed Severity Prescribed Fire	—	—
	Shaded Fuel Break	—	—
	Pre-commercial Thin	—	—
	Regeneration Harvest	—	—
	Improvement Harvest	99	69, 71, 100a, 102a
	Private Land Buffers	—	—
Partial Retention (Middleground and Background)	Low Severity Prescribed Fire	6,569	BLM 139, BLM 146, BLM164, BLM 165, BLM 166a, BLM 166b, BLM 169, BLM 170, BLM143b, BLM 171, BLM 1727a, 7c, 8d, 8f, 39f, 39n, 39q, 39v, 47, 49b, 52, 53, 54, 55, 56c, 56d, 56e, 57, 58, 59b, 59c, 60a, 60b, 60c, 61a, 61b, 61c, 61d, 62a, 62b, 63, 64a, 64b, 66, 80, 89a, 89b, 90b, 98a, 102, 103b, 103c, 107a, 107b, 107c, 113, 116a, 116b, 116e, 116f, 116g, 122a, 122b, 122c, 125, 173b
	Mixed Severity Prescribed Fire	1,715	7b, 7e, 8b, 8h, 8j, 8l, 8o, 116i, 116h, 116c
	Shaded Fuel Break	1,415	7d, 8a, 8g, 8k, 8n, 8q, 90a, 173a, 145, 144
	Pre-commercial Thin	14	131, 132
	Regeneration Harvest	1,070	BLM 143a, 104, 118, 130, 106a, 97a, 98g, 98c
	Improvement Harvest	842	BLM 140, BLM 148, BLM 147, BLM 143b, BLM 17249c, 103a, 112, 106h, 106b, 59a, 89c, 56b, 56a, 102a, 100c
	Private Land Buffers	918	72, 126, 156, 157, 160, 123d, 129e, 159, 124b, 124a

Colorado Gulch

Foreground views would have units with prescriptions of low severity prescribed fire and regeneration harvest. The regeneration harvest is proposed on BLM units with a VRM's of class III.

Middleground views would have units of private land buffer, shaded fuel break, and, low and mixed severity fire.

There would be no background views with proposed units.

Table 215. Alternative 2 units with treatment types in seen areas from Colorado Gulch Road

VQO	Treatment/Rx	Acres	Units
Retention (Foreground)	Low Severity Prescribed Fire	218	BLM 139, BLM 146
	Mixed Severity Prescribed Fire	—	—
	Shaded Fuel Break	—	—
	Pre-commercial Thin	—	—
	Regeneration Harvest	233	BLM 142a, BLM 143a
	Improvement Harvest	111	BLM 143b, BLM 147, BLM 143b
	Private Land Buffers	—	—
Partial Retention (Middleground and Background)	Low Severity Prescribed Fire	—	—
	Mixed Severity Prescribed Fire	—	—
	Shaded Fuel Break	—	—
	Pre-commercial Thin	—	—
	Regeneration Harvest	—	—
	Improvement Harvest	40	BLM 171
	Private Land Buffers	—	—

Orofino Gulch

Foreground views would include units with prescriptions of low severity prescribed fire, improvement harvests, and, private land buffer. At the north end of the gulch, closest to Helena, BLM units would be visible. These units would have prescriptions of low severity prescribed fire and are VRM Class IV.

Middle ground views would contain units of prescribed fire, improvement harvests, and, private land buffer.

Background views from Orofino would be limited with small windows of units with low and mixed severity prescribed fire.

Table 216. Alternative 2 units with treatment types in seen areas from Orofino Gulch Road.

VQO	Treatment/Rx	Acres	Units
Retention (Foreground)	Low Severity Prescribed Fire	2,051	BLM 163, BLM 165, BLM 166a, BLM 170, BLM 164, BLM 166b, 53, 54, 59b, 59c, 60a, 60b, 60c, 61a, 61b, 61c, 61d, 62a, 62b, 63, 64a, 64b, 66, 93, 100b, 103b, 103c, 107a, 107b, 107c, 113, 122b
	Mixed Severity Prescribed Fire	–	–
	Shaded Fuel Break	–	–
	Pre-commercial Thin	–	–
	Regeneration Harvest	–	–
	Improvement Harvest	166	59a, 69, 71, 100a, 103a, 112
	Private Land Buffers	239	72, 126, 124a
Partial Retention (Middleground and Background)	Low Severity Prescribed Fire	3,684	BLM 139, 39f, 39q, 39v, 52, 55, 57, 58, 65, 67, 70, 80, 86a, 86b, 87a, 87b, 88, 89b, 93, 116b, 116g, 122a, 122c
	Mixed Severity Prescribed Fire	–	–
	Shaded Fuel Break	–	–
	Pre-commercial Thin	–	–
	Regeneration Harvest	306	106a, 130
	Improvement Harvest	42	56a, 89c
	Private Land Buffers	38	124b, 156

FS RD 4000 (Unionville Rd)

The following treatment types could be seen in foreground views, improvement harvest, temporary road, private land buffer, and, shaded fuel break.

The following treatment types could be seen in middleground views, improvement harvest, temporary road, regeneration harvest, private land buffer, pre-commercial thin, and, shaded fuel break.

Background views would be limited with only a small window of private land buffer visible.

Table 217. Alternative 2 units with treatment types in seen areas from Unionville Road.

VQO	Treatment/Rx	Acres	Units
Retention (Foreground)	Low Severity Prescribed Fire	1,705	9a, 42, 77, 90b, 125, 100b, 173b
	Mixed Severity Prescribed Fire	–	–
	Shaded Fuel Break	156	90a
	Pre-commercial Thin	54	73c, 73d
	Regeneration Harvest	–	–
	Improvement Harvest	166	9b, 73e, 73b, 75, 76, 78, 81, 100c, 101, 136
	Private Land Buffers	54	123a
Partial Retention (Middleground and Background)	Low Severity Prescribed Fire	228	96, 98a, 98d, 98e, 105, 107c
	Mixed Severity Prescribed Fire	–	–
	Shaded Fuel Break	150	173a
	Pre-commercial Thin	55	131, 132, 137
	Regeneration Harvest	673	85c, 97a, 98g, 98c, 98h, 118
	Improvement Harvest	45	85b
	Private Land Buffers	557	135, 158, 159, 160, 209

Interstate 15

This sensitive viewing corridor is to the east and outside the project area and would not have foreground views that would be affected by the proposed action.

Low severity treatment units in the South Hills on both FS and BLM lands would be visible, in middleground and middleground views.

Table 218. Alternative 2 units with treatment types in seen areas from Interstate 15

VQO	Treatment/Rx	Acres	Units
Retention (Foreground)	Low Severity Prescribed Fire	—	—
	Mixed Severity Prescribed Fire	—	—
	Shaded Fuel Break	—	—
	Pre-commercial Thin	—	—
	Regeneration Harvest	—	—
	Improvement Harvest	—	—
	Private Land Buffers	—	—
Partial Retention (Middleground and Background)	Low Severity Prescribed Fire	—	—
	Mixed Severity Prescribed Fire	—	—
	Shaded Fuel Break	—	—
	Pre-commercial Thin	—	—
	Regeneration Harvest	168	118
	Improvement Harvest	—	—
	Private Land Buffers	—	—

Park Lake and Campground

Park Lake and campground are outside the project boundary but within the analysis area. There would be no foreground views. There would be a limited view of a regeneration harvest in the middleground distance zone. There would be no background views.

Table 219. Alternative 2 units with treatment types in seen areas from Park Lake and Park Lake Campground.

VQO	Treatment/Rx	Acres	Units
Retention (Foreground)	Low Severity Prescribed Fire	—	—
	Mixed Severity Prescribed Fire	—	—
	Shaded Fuel Break	—	—
	Pre-commercial Thin	—	—
	Regeneration Harvest	—	—
	Improvement Harvest	—	—
	Private Land Buffers	—	—
Partial Retention (Middleground and Background)	Low Severity Prescribed Fire	—	—
	Mixed Severity Prescribed Fire	—	—
	Shaded Fuel Break	—	—
	Pre-commercial Thin	148	—
	Regeneration Harvest	976	26, 49a, 97a, 106a, 106c, 106e, 110a, 110b, 110b, 110c
	Improvement Harvest	744	49c, 50, 51, 76, 78, 94d, 106b, 106h, 117, 119
	Private Land Buffers	255	—

Continental Divide National Scenic Trail (CDNST)

The nature of this portion of trail is discussed in the Existing Conditions section. The trail would be encapsulated in a unit that is 300 feet on either side of the trail's centerline. The objective of the treatment would be to ensure a safe and open trail corridor while maintaining an aesthetically appealing setting. Treatment along the trail in alternative 2 would be with mechanized equipment. This would allow for more undulation of edges and enhancement of vistas from the trail. It would not be the intention to clear the entire 300 feet on either side of the centerline. Rather, the unit geometry would allow for flexibility to tie into meadows, undulate the edges, mobilize equipment, and, other aesthetic enhancements. The trail's aesthetics would be as much of an emphasis as the safety and welfare of trail users.

Immediate foreground views (300 feet) contain a prescription of shaded fuel break. The layout, design, and, methodology to reach this objective would be coordinated with the Forest Landscape Architect. Other foreground views would be mixed and low severity prescribed fire.

Middleground views would contain units with prescriptions of shaded fuel break, mixed and low severity prescribed fire, regeneration harvest, temporary road, private land buffer, pre-commercial thinning and improvement harvest.

Background views are limited, but would contain units with prescriptions of low severity prescribed fire, shaded fuel break, regeneration harvest, private land buffer, improvement harvest, and, pre-commercial thinning.

Table 220. Alternative 2 units with treatment types in seen areas from CDNST.

VQO	Treatment/Rx	Acres	Units
Retention (Foreground)	Low Severity Prescribed Fire	850	7c, 8d
	Mixed Severity Prescribed Fire	241	7e
	Shaded Fuel Break	684	7d, 8q, 144, 145
	Pre-commercial Thin	—	—
	Regeneration Harvest	—	—
	Improvement Harvest	—	—
	Private Land Buffers	—	—
Partial Retention (Middleground and Background)	Low Severity Prescribed Fire	6,627	BLM 139, BLM 142b, BLM 146, BLM 163, BLM 164, BLM 165, BLM 166a, BLM 166b, BLM 167, BLM 169, 8f, 8p 28, 37, 39a, 39d, 39e, 39f, 39j, 39k, 39l, 39m, 39n, 39o, 39p, 39q, 39r, 39u, 39v, 52, 55, 56c, 56d, 58, 65, 67, 68, 70, 80, 86a, 86b, 90b, 92c, 92d, 93, 98a, 103c, 107a, 107c, 116b, 116g, 141, 158
	Mixed Severity Prescribed Fire	184	8b, 8h, 8j, 8l, 116c, 116i
	Shaded Fuel Break	581	8a, 8g, 8k, 8n, 90a
	Pre-commercial Thin	233	2, 6, 40, 41, 131, 132, 134, 135, 137
	Regeneration Harvest	3,579	BLM 142a, BLM 143a, 1, 3, 11, 14, 15, 16, 17, 18, 22, 23, 24, 26, 27a, 27b, 27c, 29, 30, 33, 36, 36, 39c, 98c, 98g, 98h, 106a, 118, 130
	Improvement Harvest	778	BLM 140, BLM 148, BLM 147, BLM 143b, BLM 171, BLM 172, 39b, 39g, 39h, 39i, 39s, 56a, 56b, 69, 103a, 106b, 117
	Private Land Buffers	1,517	72, 124a, 124b, 126, 127a, 127c, 127d, 127f, 127g, 127h, 127i, 127k, 127n, 127q, 128, 129a, 129b, 129c, 129d, 129e, 149, 152, 156, 157,

Irreversible/Irretrievable Commitments

No irreversible or irretrievable commitments of resources are anticipated.

Cumulative Effects

The roadside hazard tree reduction project has created lines and forms in the vegetative canopy and resulted in cut stumps and slash piles visible from roadsides. Removal of the hazard trees is conducted a specific distance from the road corridor. This has resulted in a geometric corridor of forest vegetation and textures along the roads adjacent to treatments that appear unnatural and is very obvious to forest visitors.

Due to the conditions of hazard trees, long-term results of the Hazard Tree Removal Project are similar with or without implementation of the project. The effects of treatments vary in duration and intensity depending upon site-specific conditions. It is anticipated that the short term effects of cut stumps and slash would diminish over time as under-story vegetation grows above the stumps. Long term, it may take 6-years or longer for vegetation to break up the lines and geometric forms of the hazard tree removal treatments and soften the edges of units. However, accelerated regeneration of the under-story would result, creating species diversity and increased variety in color and texture to the landscapes.

Additionally, implementation of these measures minimized short-term negative impacts and will result in longer term, positive effects to the scenic quality of the project area.

Alternative 3: Proposed Action

Alternative 3 is designed in response to issues presented in both internal and external scoping comments about potential treatment effects on Inventoried Roadless Areas, wildlife, and recreationist values associated with the numerous trail systems in the project area.

Direct/Indirect Effects

As described in the Affected Environment section, the TSH Project area is visible from many sensitive viewing areas including the CDNST. The effects of the proposed activities are described below for each sensitive viewing area and Management Areas with VQO's of Retention and/or Partial Retention.

Management Areas

The majority of acres that would be treated in MA's with VQO's of either, Retention, Partial Retention/Retention, and, Partial Retention, would have the treatment type of Low Severity Prescribed Fire. There would be many foreground views from trails and roads. Temporary road would be built. Improvement Harvest and other treatment types would still occur in residential areas, but not in Cox's Lake immediate area. There is the potential to see the linear effects of cable yarding.

Table 221. Alternative 3 units with treatment types and MA direction

VQO	Treatment/Rx	Acres	Units
Retention	Low Severity Prescribed Fire	4,607	52, 53, 54, 55, 56a, 56b, 56c, 56d, 56e, 57, 58, 59b, 59c, 60a, 60b, 60c, 61a, 61b, 61c, 61d, 62a, 62b, 63, 64a, 64b, 65, 66, 67, 68, 69, 70, 86a, 87a, 88, 89a, 89b, 90b, 100b, 102, 103b, 103c, 107a, 107b, 107c, 113, 122a, 122b, 122c
	Mixed Severity Prescribed Fire	–	–
	Shaded Fuel Break	526	90a, 145, 178a
	Pre-commercial Thin	–	–
	Regeneration Harvest	–	–
	Improvement Harvest	255	59a, 71, 89c, 100a, 101, 103a, 103d, 112
	Private Land Buffers	803	72, 123, 124a, 124b, 126, 156, 159, 160, 161
	Low Severity Grassland Prescribed Fire	1,361	39q, 86b, 93, 116g
Partial Retention/Retention	Low Severity Prescribed Fire	161	141, 158
	Mixed Severity Prescribed Fire	–	–
	Shaded Fuel Break	698	8a, 144
	Pre-commercial Thin	69	133, 134, 135
	Regeneration Harvest	43	39c
	Improvement Harvest	93	39b, 39h
	Private Land Buffers	50	159
	Low Severity Grassland Prescribed Fire	539	39q
Partial Retention	Low Severity Prescribed Fire	78	39e, 39g, 39i, 39j, 39f, 39j, 39t, ,
	Mixed Severity Prescribed Fire	–	–
	Shaded Fuel Break	–	–
	Pre-commercial Thin	40	22
	Regeneration Harvest	–	–
	Improvement Harvest	–	–
	Private Land Buffers	417	123, 160
	Low Severity Grassland Prescribed Fire	611	39q, 116a

Highway 12

There would be few units in foreground views including a private land buffer unit, which would be directly next to Highway 12. A few BLM units would also be in foreground

views with prescriptions of low severity prescribed fire. The BLM visual resource management (VRM) class for these two units is class IV (defined in Table 3 of the Scenery Report).

The majority of units that would be seen from Highway 12 are in the middleground distance zone. The prescriptions for most of these units on FS land are private land buffer, shaded fuel break, pre-commercial thinning, and, low severity, mixed severity and low severity grassland prescribed fire. There would be BLM units visible in the middleground that have prescriptions of low severity prescribed fire. There would be temporary road visible as well. The VRM classes for these units are class III.

There would be limited background views of units on FS land. The prescriptions for these units are low severity prescribed fire, improvement harvest, private land buffer, and regeneration harvests. Some temporary road would be visible in the regeneration harvests.

The major differences between alternative 2 and 3:

- BLM units in foreground and middleground would become low severity prescribed fire treatments from improvement harvests
- Large unit in the middleground would become low severity grassland fire from low severity prescribed fire
- There would be less units in middleground and background and therefore less would be visible

Table 222. Alternative 3 units with Treatment types in seen areas from Highway 12.

VQO	Treatment/Rx	Acres	Units
Retention (Foreground)	Low Severity Prescribed Fire	53	BLM 147, BLM 148
	Mixed Severity Prescribed Fire	–	–
	Shaded Fuel Break	67	144
	Pre-commercial Thin	–	–
	Regeneration Harvest	–	–
	Improvement Harvest	–	–
	Private Land Buffers	20	157

VQO	Treatment/Rx	Acres	Units
Partial Retention (Middleground and Background)	Low Severity Prescribed Fire	7,832	BLM 139, BLM 146, BLM164, BLM 165, BLM 166a, BLM 166b, BLM 169, BLM 170, BLM 143a, BLM 140, BLM143b, BLM 171, BLM 172, 8c, 8e, 9a, 9b, 28, 37, 39a, 39d, 39e, 39f, 39g, 39i, 39j, 39m, 39n, 39o, 39p, 39t, 42, 52, 53, 54, 55, 56a, 56b, 56c, 56d, 56e, 57, 58, 59b, 59c 60a, 60b, 60c, 61a, 61c, 61d, 62a, 62b, 63, 64a, 64b, 65, 66, 67, 68, 69, 70, 81, 86a, 87a, 88, 89b, 90b, 100b, 102, 103b, 103c, 105, 107a, 107b, 107c, 113, 114b, 116c, 122a, 122b, 122c, 125, 136, 141, 158, 176, 178c, 141, 173b
	Mixed Severity Prescribed Fire	656	8b, 8d, 116b, 178b
	Shaded Fuel Break	1,282	8a, 90a, 116d, 116k, 116l, 144, 145, 178a
	Pre-commercial Thin	445	2, 6, 34, 40, 41, 43b, 48, 73a, 73c, 73d, 121, 133, 134, 135, 137, 138
	Regeneration Harvest	2,449	4, 5, 11, 14, 15, 16, 17, 18, 19, 20, 22, 23, 24, 29, 29a, 33, 35, 39c, 106a, 106b, 110b,
	Improvement Harvest	1,382	39b, 39h, 39g, 39s, 43a, 50, 51, 59a, 71, 73b, 73e, 75, 76, 78, 89c, 100a, 100c, 101, 103a, 103d, 112, 144a, 117, 175
	Private Land Buffers	2,275	BLM 143c, 72, 123, 124a, 124b, 126, 127a, 127b, 127c, 1237d, 127e, 127f, 127g, 127h, 127i, 127j, 127k, 127l, 127m, 127n, 127o, 127p, 127r, 128, 129a, 129b, 129c, 129d, 129e, 149, 150, 151, 152, 153, 154, 156, 157, 159, 160, 161, 162, 174, 177,
	Low Severity Grassland Prescribed Fire	1,661	39q, 77, 86b, 93, 116a, 116e, 116f, 116g, 116j

Cromwell Dixon Campground

No units are visible from this developed recreation site.

Moose Creek Campground

The immediate foreground view in this developed recreation site was already treated for hazard trees and therefore mostly devoid of trees. Foreground views that would result from this project, would have units with prescriptions of shaded fuel break, low severity prescribed fire, and, private land buffer.

Middleground views would contain units with prescriptions of shaded fuel break, private land buffer, low severity prescribed fire, and, regeneration harvest with temporary roads.

Background views would be limited with only glimpses of units with pre-commercial thinning and private land buffer.

The major differences between alternative 2 and 3:

- The area of treatment for shaded fuel break and low severity prescribed fire in the foreground would be less in alternative 3 than alternative 2
- A unit in the middleground would become low severity grassland fire from low severity prescribed fire.

Table 223. Alternative 3 units with treatment types in seen areas from Moose Creek Campground.

VQO	Treatment/Rx	Acres	Units
Retention (Foreground)	Low Severity Prescribed Fire	294	8c, 141, 158
	Mixed Severity Prescribed Fire	—	—
	Shaded Fuel Break	502	8a
	Pre-commercial Thin	—	—
	Regeneration Harvest	—	—
	Improvement Harvest	—	—
	Private Land Buffers	120	149
Partial Retention (Middleground and Background)	Low Severity Prescribed Fire	498	37, 39a, 39e, 39f, 39g, 39j, 39i, 39m, 39n, 39o, 39t
	Mixed Severity Prescribed Fire	155	8b
	Shaded Fuel Break	222	116d, 178a
	Pre-commercial Thin	25	34
	Regeneration Harvest	567	11, 39c
	Improvement Harvest		39g, 39i, 39s
	Private Land Buffers	276	129c, 153
	Low Severity Grassland Prescribed Fire	539	39q

Tenmile Picnic Day Area

The immediate foreground view in this developed recreation site was already treated for hazard trees and therefore mostly devoid of trees. Foreground views that would result from this project, would have units with prescriptions of shaded fuel break, low severity

prescribed fire, and, regeneration harvest with temporary roads, and, improvement harvests. The units of prescribed fire to the west would be smaller in area than alternative 2.

Middleground views would contain units with prescriptions of shaded fuel break, low severity prescribed fire, pre-commercial thin, regeneration harvest with temporary roads, and, improvement harvests with temporary roads.

Background views would be limited with only glimpses of units with pre-commercial thinning, low severity prescribed fire, and, private land buffer.

The major differences between alternative 2 and 3:

- The area of treatment for shaded fuel break and low severity prescribed fire in the foreground would be less in alternative 3 than alternative 2
- Unit in the middleground would become low severity grassland fire from low severity prescribed fire.

Table 224. Alternative 3 units with treatment types in seen areas from Tenmile Picnic Area.

VQO	Treatment/Rx	Acres	Units
Retention (Foreground)	Low Severity Prescribed Fire	311	8c, 39e, 141, 158
	Mixed Severity Prescribed Fire	–	–
	Shaded Fuel Break	495	8a
	Pre-commercial Thin	55	41, 133
	Regeneration Harvest	43	39c
	Improvement Harvest	105	39b, 39h, 39s
	Private Land Buffers	120	149
Partial Retention (Middleground and Background)	Low Severity Prescribed Fire	458	37, 39o, 39n, 39m, 39j, 39i, 39f, 39t
	Mixed Severity Prescribed Fire	155	8b
	Shaded Fuel Break	18	116d
	Pre-commercial Thin	25	34
	Regeneration Harvest	562	11, 33
	Improvement Harvest	–	–
	Private Land Buffers	55	153
	Low Severity Grassland Prescribed Fire	540	39q

Mt. Helena National Recreation Trail

Foreground views would have units with prescriptions of low severity prescribed fire and improvement harvest.

Middleground views would contain units with prescriptions of shaded fuel break, low and mixed severity prescribed fire, pre-commercial thin, regeneration harvest with temporary roads, improvement harvests, and, private land buffer.

Background views are limited and are of units with pre-commercial thinning, mixed severity prescribed fire, private land buffer, shaded fuel break, and, regeneration harvests with temporary road.

The major differences between alternative 2 and 3:

- Unit 69 that would be in foreground view would become low severity prescribed fire from improvement harvest
- Unit 86b would become low severity grassland fire from low severity prescribed fire
- BLM units along Colorado Gulch would become low severity prescribed fire from regeneration harvest.

Table 225. Alternative 3 units with treatment types in seen areas from Mt. Helena Ridge Trail.

VQO	Treatment/Rx	Acres	Units
Retention (Foreground)	Low Severity Prescribed Fire	1,492	65, 67, 69, n 70, 86a, 87a, 88, 100b, 102
	Mixed Severity Prescribed Fire	—	—
	Shaded Fuel Break	—	—
	Pre-commercial Thin	—	—
	Regeneration Harvest	—	—
	Improvement Harvest	52	71, 100a
	Private Land Buffers	—	—
Partial Retention (Middleground and Background)	Low Severity Prescribed Fire	4,219	BLM 139, BLM 146, BLM164, BLM 165, BLM 166a, BLM 166b, BLM 169, BLM 170, BLM 143a, BLM 140, BLM143b, BLM 171, BLM 172 39n, 52, 53, 54, 55, 56a, 56b, 56c, 56d, 56e, 57, 58, 59b, 59c, 60a, 60b, 60c, 61a, 61b, 61c, 61d, 62a, 62b, 63, 64a, 64b, 66, 68, 89b, 90b, 103b, 103c, 107a, 107b, 107c, 113, 116c, 122a, 122b, 122c, 125
	Mixed Severity Prescribed Fire	449	8b, 8d, 116b
	Shaded Fuel Break	1,282	8a, 90a, 116d, 116k, 116l, 144, 145, 178a
	Pre-commercial Thin	—	—
	Regeneration Harvest	—	—
	Improvement Harvest	148	59a, 89c, 100a, 100c, 103a, 103d, 112
	Private Land Buffers	1,152	72, 123, 124a, 124b, 126, 129e, 156, 157, 159, 160

VQO	Treatment/Rx	Acres	Units
	Low Severity Grassland Prescribed Fire	1,041	39q, 116a, 116e, 116f, 116g, 116j,

Colorado Gulch

Foreground views would have units with prescriptions of low severity prescribed fire and regeneration harvest. The regeneration harvest is proposed on BLM units with a VRM's of class III.

Middleground views would have units of private land buffer, shaded fuel break, and, low and mixed severity fire.

There are would be no background views with proposed units.

The major differences between alternative 2 and 3:

- Units in the foreground would be low severity prescribed fire in alternative 3 and regeneration harvest in alternative 2.

Table 226. Alternative 3 units with treatment types in seen areas from Colorado Gulch.

VQO	Treatment/Rx	Acres	Units
Retention (Foreground)	Low Severity Prescribed Fire	562	BLM 139, BLM 146, BLM 142a, BLM 143a, BLM 143b, BLM 147, BLM143b
	Mixed Severity Prescribed Fire	—	—
	Shaded Fuel Break	—	—
	Pre-commercial Thin	—	—
	Regeneration Harvest	—	—
	Improvement Harvest	—	—
	Private Land Buffers	—	—
Partial Retention (Middleground and Background)	Low Severity Prescribed Fire	40	BLM 171
	Mixed Severity Prescribed Fire	—	—
	Shaded Fuel Break	—	—
	Pre-commercial Thin	—	—
	Regeneration Harvest	—	—
	Improvement Harvest	—	—
	Private Land Buffers	—	—
	Low Severity Grassland Prescribed Fire	—	—

Orofino Gulch

Foreground views would include units with prescriptions of low severity prescribed fire, improvement harvests, private land buffer, and, low severity grassland prescribed fire. At

the north end of the gulch, closest to Helena, BLM units would be visible. These units have prescriptions of low severity prescribed fire and are VRM Class IV.

Middle ground views would contain units of prescribed fire, improvement harvests, private land buffer, and, low severity grassland prescribed fire.

Background views from Orofino would be limited with small windows of units with low severity prescribed fire, mixed severity prescribed fire, and, low severity grassland prescribed fire.

The major differences between alternative 2 and 3:

- Units in all three distance zones would be mixed severity prescribed fire in alternative 2 and low severity grassland prescribed fire.

Table 227. Alternative 3 units with treatment types in seen areas from Orofino Gulch Road.

VQO	Treatment/Rx	Acres	Units
Retention (Foreground)	Low Severity Prescribed Fire	2,051	BLM 163, BLM 165, BLM 166a, BLM 170, BLM 164, BLM 166b, 53, 54, 59b, 59c, 60a, 60b, 60c, 61a, 61b, 61c, 61d, 62a, 62b, 63, 64a, 64b, 66, 93, 100b, 103b, 103c, 107a, 107b, 107c, 113, 122b
	Mixed Severity Prescribed Fire	–	–
	Shaded Fuel Break	–	–
	Pre-commercial Thin	–	–
	Regeneration Harvest	–	–
	Improvement Harvest	166	59a, 69, 71, 100a, 103a, 112
	Private Land Buffers	239	72, 126, 124a
Partial Retention (Middleground and Background)	Low Severity Prescribed Fire	3,684	BLM 139, 39f, 39q, 39v, 52, 55, 57, 58, 65, 67, 70, 80, 86a, 86b, 87a, 87b, 88, 89b, 93, 116b, 116g, 122a, 122c
	Mixed Severity Prescribed Fire	–	–
	Shaded Fuel Break	–	–
	Pre-commercial Thin	–	–
	Regeneration Harvest	306	106a, 130
	Improvement Harvest	42	56a, 89c
	Private Land Buffers	38	124b, 156

FS RD 4000 (Unionville Rd)

The following treatment types would be seen in foreground views, improvement harvest, temporary road, private land buffer, low severity prescribed fire, pre-commercial thin, and, shaded fuel break.

The following treatment types would be seen in middleground views, improvement harvest, temporary road, private land buffer, low severity prescribed fire, pre-commercial thin, and, shaded fuel break.

Background views would be limited with only a small window of private land buffer visible.

The major differences between alternative 2 and 3:

- There would be no regeneration harvest visible in alternative 3
- While there is the same number of treatment types in both alternatives, there are far less acres that would be treated and therefore visible in alternative 3.

Table 228. Alternative 3 units with treatment types in seen areas from FS Road 4000 (Unionville Road).

VQO	Treatment/Rx	Acres	Units
Retention (Foreground)	Low Severity Prescribed Fire	1,705	9a, 42, 77, 90b, 125, 100b, 173b
	Mixed Severity Prescribed Fire	–	–
	Shaded Fuel Break	156	90a
	Pre-commercial Thin	54	73c, 73d
	Regeneration Harvest	–	–
	Improvement Harvest	166	9b, 73e, 73b, 75, 76, 78, 81, 100c, 101, 136
	Private Land Buffers	54	123a
Partial Retention (Middleground and Background)	Low Severity Prescribed Fire	228	96, 98a, 98d, 98e, 105, 107c
	Mixed Severity Prescribed Fire	–	–
	Shaded Fuel Break	150	173a
	Pre-commercial Thin	55	131, 132, 137
	Regeneration Harvest	673	85c, 97a, 98g, 98c, 98h, 118
	Improvement Harvest	45	85b
	Private Land Buffers	557	135, 158, 159, 160, 209

Interstate 15

This sensitive viewing corridor is to the east and outside the project area and would not have foreground views that will be affected by the proposed action.

Glimpses of low severity treatment units in the South Hills on both FS and BLM lands would be visible in middleground and background views.

There are no differences from this viewing platform between alternatives.

Table 229. Alternative 3 units with treatment types in seen areas from Interstate 15.

VQO	Treatment/Rx	Acres	Units
Retention (Foreground)	Low Severity Prescribed Fire	–	–
	Mixed Severity Prescribed Fire	–	–
	Shaded Fuel Break	–	–
	Pre-commercial Thin	–	–
	Regeneration Harvest	–	–
	Improvement Harvest	–	–
	Private Land Buffers	–	–
Partial Retention (Middleground and Background)	Low Severity Prescribed Fire	2,582	BLM 164, BLM 165, BLM 166a, BLM 166b, BLM 169, BLM 170, 53, 54, 55, 57, 59b, 60c, 60a, 61c, 61c, 62a, 63, 64a, 64b, 65, 66, 86a, 87a, 88, 113, 114b, 122a, 122b, 122c
	Mixed Severity Prescribed Fire	–	–
	Shaded Fuel Break	562	90a, 144, 173a
	Pre-commercial Thin	148	43b, 48, 121, 137, 138
	Regeneration Harvest	95	106a, 110b
	Improvement Harvest	773	43a, 50, 51, 76, 78, 117, 175
	Private Land Buffers	256	72, 124b, 126, 156
	Low Severity Grassland Prescribed Fire	621	77, 86b, 93

Park Lake and Campground

Park Lake and campground is outside the project boundary and there would be no units visible in this alternative.

The major differences between alternative 2 and 3:

- There are no units visible in alternative 3 and a regeneration harvest unit in alternative 2.

Continental Divide National Scenic Trail (CDNST)

The nature of this portion of trail is discussed in the Existing Conditions section. The trail would be encapsulated in a unit that is 300 feet on either side of the trail's centerline. The objective of the treatment would be to ensure a safe and open trail corridor while maintaining an aesthetically appealing setting. Treatment along the trail in alternative 3 would be with hand crews only. It would not be the intention to clear the entire 300 feet on either side of the centerline. Rather, the unit geometry would allow for flexibility to tie into meadows, undulate the edges, and, other aesthetic enhancements. The trail's aesthetics would be as much of an emphasis as the safety and welfare of trail users.

Immediate foreground views (300 feet) contain a prescription of shaded fuel break. The layout, design, and methodology to reach this objective would be coordinated with the Forest Landscape Architect. Other foreground views would be mixed and low severity prescribed fire.

Middleground views would contain units with prescriptions of shaded fuel break, mixed and low severity prescribed fire, regeneration harvest, temporary road, private land buffer, pre-commercial thinning and improvement harvest.

Background views are limited, but would contain units with prescriptions of low severity prescribed fire, shaded fuel break, regeneration harvest, private land buffer, improvement harvest, and, pre-commercial thinning.

The major differences between alternative 2 and 3:

- The method of treatment for shaded fuel break 300 feet on either side of the CDNST would be accomplished by hand and not mechanical means
- A unit in the middleground becomes low severity grassland fire instead of low severity prescribed fire
- There would be less units in the middleground therefore less would be visible.

Table 230. Alternative 3 units with treatment types in seen areas from CDNST.

VQO	Treatment/Rx	Acres	Units
Retention (Foreground)	Low Severity Prescribed Fire	147	8e
	Mixed Severity Prescribed Fire	159	8d
	Shaded Fuel Break	864	8a, 144, 145
	Pre-commercial Thin	—	—
	Regeneration Harvest	—	—
	Improvement Harvest	—	—
	Private Land Buffers	—	—
Partial Retention (Middleground and Background)	Low Severity Prescribed Fire	4,401	BLM 139, BLM 142b, BLM 140, BLM 143a, BLM 148, BLM 147, BLM 143b, BLM 171, BLM 172 BLM 146, BLM 163, BLM 164, BLM 165, BLM 166a, BLM 166b, BLM 167, BLM 169, 28, 37, 39a, 39d, 39e, 39f, 39g, 39i, 39j, 39m, 39n, 39o, 39p, 39t, 52, 55, 56a, 56c, 56d, 58, 65, 67, 68, 70, 80, 86a, 87a, 90b, 103c, 107a, 107c, 141, 158, 178c
	Mixed Severity Prescribed Fire	656	8b, 8d, 116b, 178b
	Shaded Fuel Break	378	90a, 116d, 178a
	Pre-commercial Thin	219	2, 6, 40, 41, 134, 135, 137
	Regeneration Harvest	1,941	11, 14, 15, 16, 17, 18, 22, 23, 24, 29a, 33, 39c, 180
	Improvement Harvest	211	39b, 39h, 39s, 103a, 103d, 117
	Private Land Buffers	1,558	72, 124a, 124b, 126, 127a, 127c, 127d, 127f, 127g, 127h, 127i, 127k, 127n, 127q, 128, 129a, 129b, 129c, 129d, 129e, 149, 152, 156, 157, 174
	Low Severity Grassland Prescribed Fire	1,361	39q, 86b, 93, 116g

Irreversible/Irretrievable Commitments

No irreversible or irretrievable commitments of resources are anticipated.

Cumulative Effects

Cumulative effects for this alternative are expected to be the same as alternative 2, but to a slightly lesser degree since fewer acres are treated in this alternative. The exception would be Unit 180, which is a regeneration harvest in alternative 3 and not alternative 2.

Google Earth Simulations

For the simulations from critical viewpoints, the following applies. All polygons depicted will not be completely treated. The shape is for analysis purposes only and the effects of implementation would be less in area and reflect design criteria applied by resource specialists. The treatment types have been color coded. Refer to Figure 106 for location of critical viewpoints. Alternative 2 simulations are on the left and alternative 3 is on the right for comparative purposes.

- Purple= low severity prescribed fire
- Pink= mix severity prescribed fire
- Light blue= shaded fuel break
- Dark blue= regeneration harvest
- Gold= improvement harvest
- Red= private land buffer
- Gray= low severity prescribed fire (only in alternative 3).

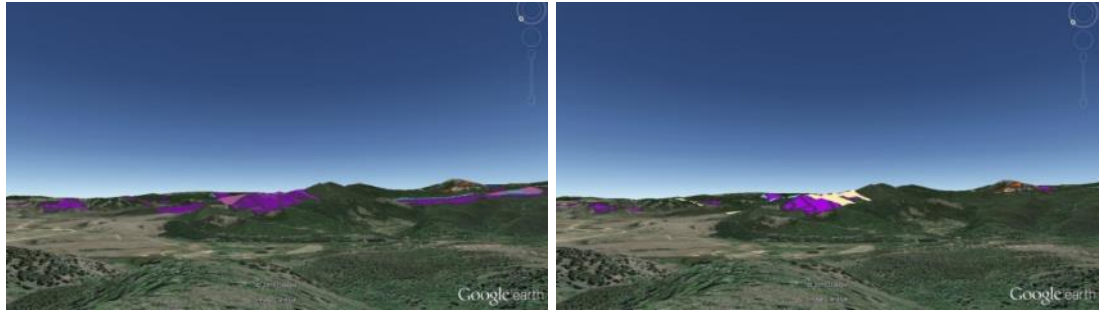


Figure 107. Looking southeast from scenic pullout along Highway 12.

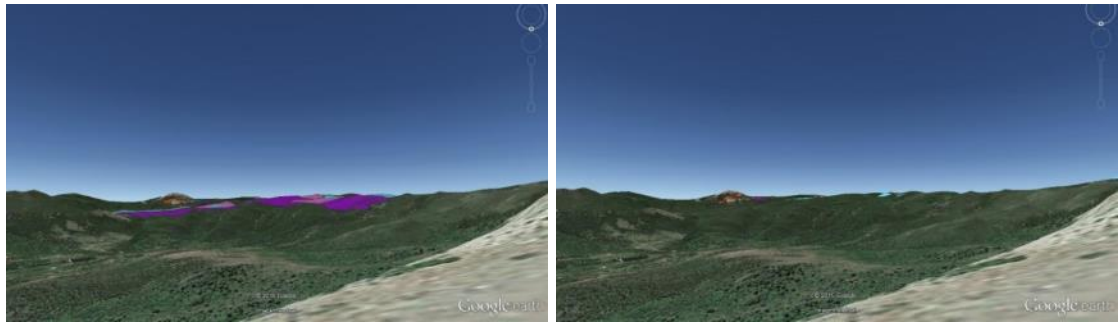


Figure 108. Looking southwest from scenic pullout along Highway 12.

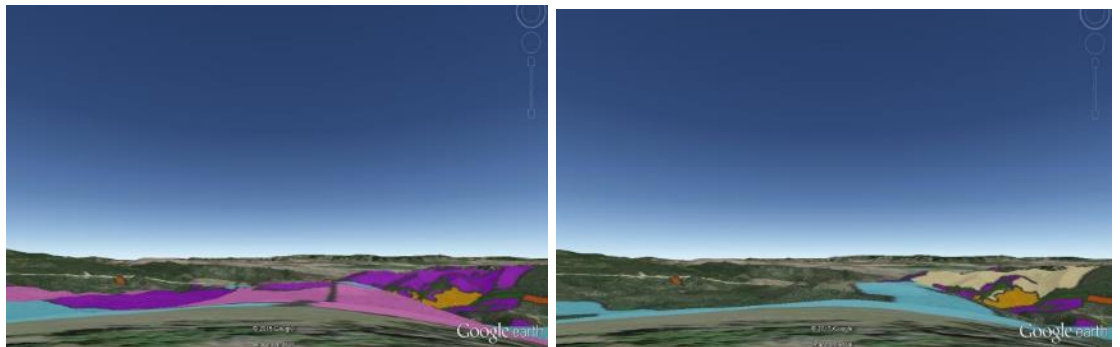


Figure 109. Looking northeast from a park along the CDNST.

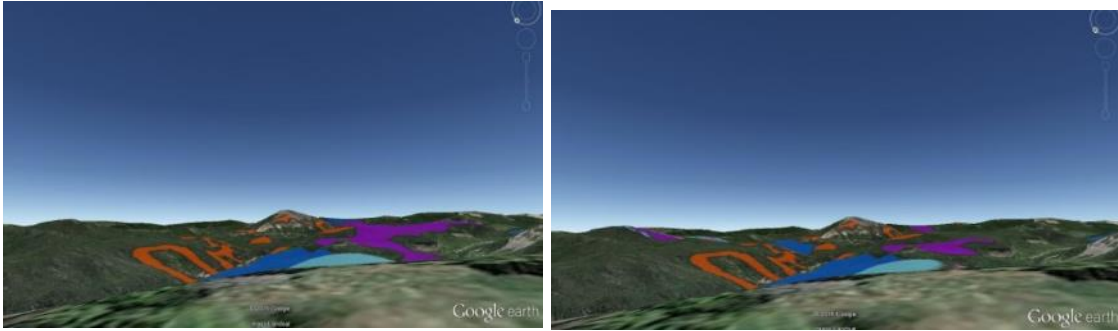


Figure 110. Looking southeast from a park along the CDNST.

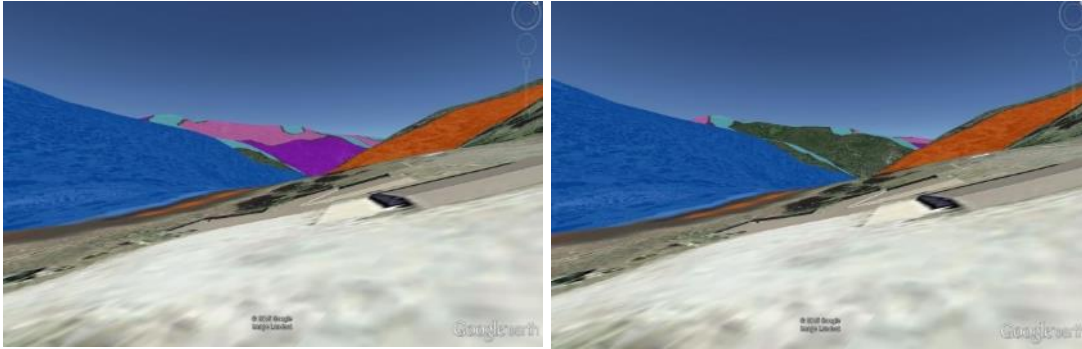


Figure 111. Looking north along Rimini Road.

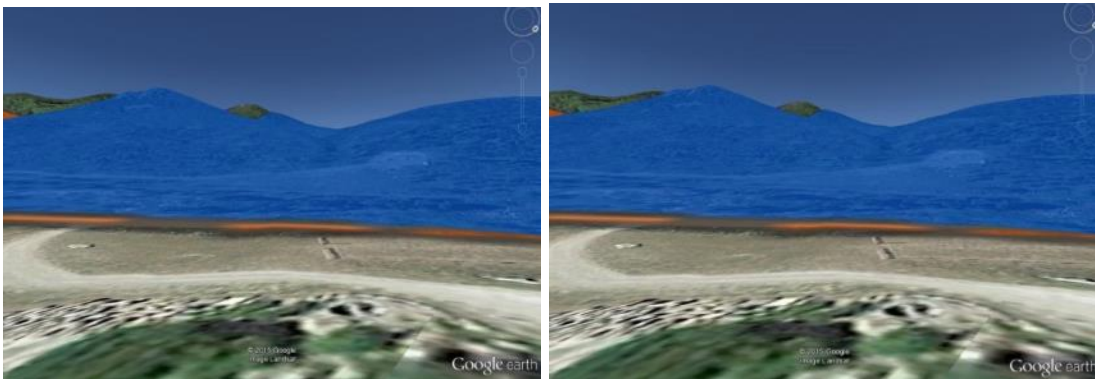


Figure 112. Looking west along Rimini Road.

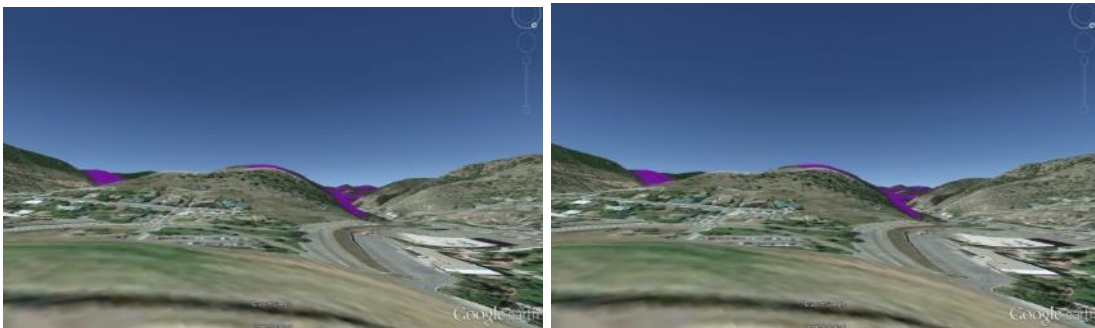


Figure 113. Looking southwest from City of Helena's Historic Fire Tower.

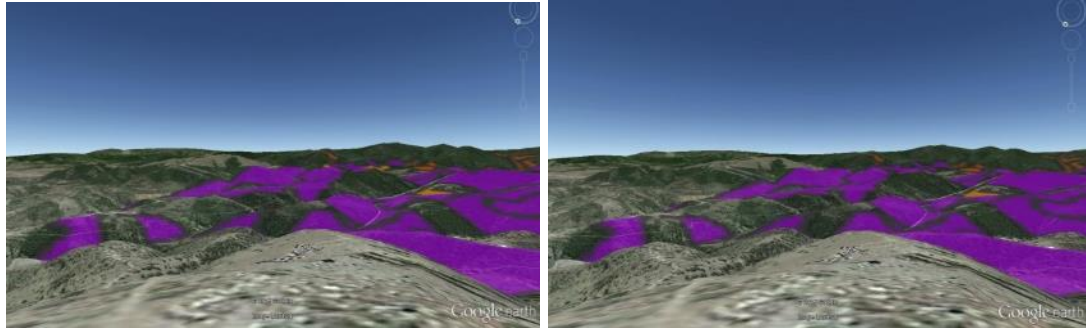


Figure 114. Looking southeast from the summit of Mt. Helena.

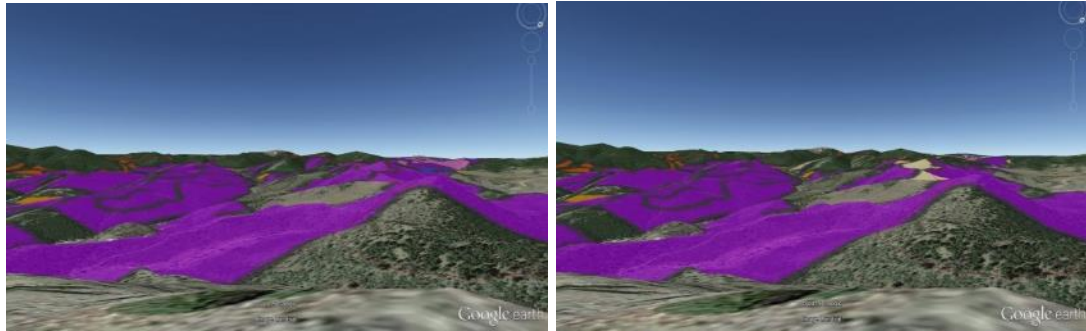


Figure 115. Looking southwest from the summit of Mt. Helena.

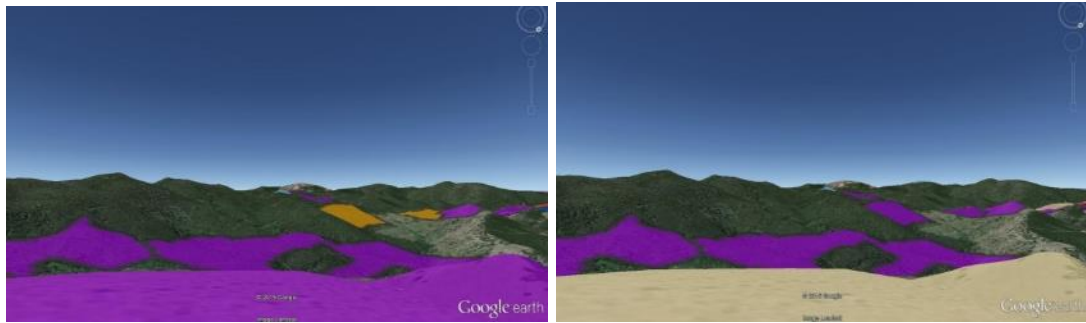


Figure 116. Looking southwest from Mt. Helena Ridge National Recreation Trail.

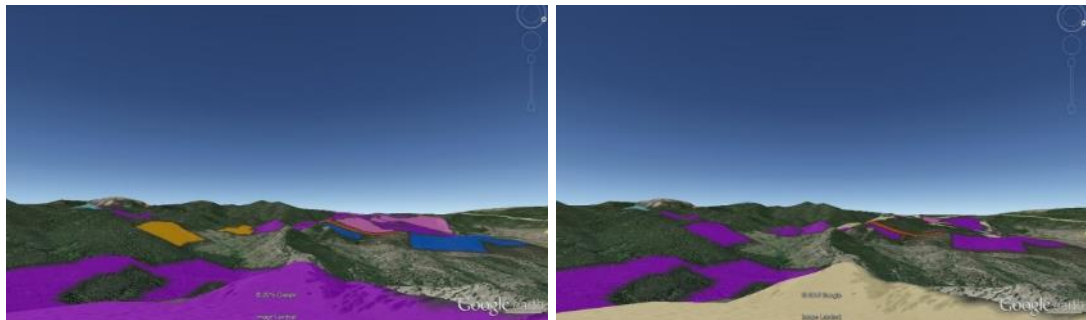


Figure 117. Looking west from Mt. Helena Ridge National Recreation Trail.

Conclusions

Scenery Forest Service Plan Consistency

Implementation of both action alternatives would be consistent with the 1986 Helena National Forest Plan. By implementing the design criteria described above, VQOs for maximum modification, modification, partial retention, and retention would be met.

Proposed landings, temporary roads, skyline corridors, and, skid trails in areas with VQO's of retention and partial retention would meet VQO standards but not immediately upon implementation of activities. However, design criteria would minimize any short-term negative impacts and will result in long –term positive effects to the scenic quality of the project area.

Forest-wide standards for Insects and Disease provide direction to use silvicultural systems to: (1) improve species diversity and growth, and vigor for stands, and (2) increase the size diversity and class diversity between stands. The management activities proposed in this project are tools to rehabilitate the vegetative condition within the project area. Several large stands of dead trees would be removed, providing an opportunity to improve the species diversity, growth and vigor of the vegetation and trending towards a more resilient landscape to disturbance such as insect and disease as well as wildfire. The Visual Management System identifies rehabilitation as a short-term management alternative. "Landscape rehabilitation is used to restore landscapes containing undesirable visual impacts to a desired visual quality. It may not always be possible to immediately achieve the prescribed visual quality objective with rehabilitation, but should provide a more visually desirable landscape in the interim" (USDA, 1974).

The potential direct, indirect, and cumulative effects of the proposed activities to visual resources would be consistent with forest plan direction for visual resources because the application of the landscape rehabilitation management alternative as outlined in the VMS would allow a longer period of time for the retention VQO to be achieved.

The purpose of proposed activities in the Tenmile – South Helena project are impart aimed at reducing the risk of post wildfire effects on the landscape and creating vegetation conditions that are more resilient to disturbance such as insect and disease as well as wildfire.

Scenery Butte Field Office Resource Management Plan Consistency

The proposed action complies with the Butte Field Office Resource Management Plan.

Roadless Expanse

Introduction

This analysis describes the existing condition of the roadless expanse¹⁹ that is within the Tenmile – South Helena project area. The roadless expanse includes the Jericho Mountain and Lazyman Gulch Inventoried Roadless Areas²⁰, (IRAs) as well as other

¹⁹ A roadless expanse refers to a contiguous area comprised of an uninventoried roadless area and an inventoried roadless area. From *Smith v. United States Forest Service*, 33 F.3d 1072 (9th Cir. 1994), and *National Audubon Society v. United States Forest Service*, 46 F.3d 1437 (9th Cir. 1993).

²⁰ Inventoried Roadless Areas are those areas designated as Inventoried Roadless Areas pursuant to 36 CFR 294 Subpart B, §294.11. This includes areas identified in a set of inventoried roadless area maps,

lands that are roadless and contiguous to these IRAs. This roadless analysis also describes the potential effects to the roadless characteristics and wilderness attributes of the roadless expanse from the proposed treatment activities identified in the alternatives.

The HLCNF is proposing to improve conditions for public and firefighter safety in the event of a wildfire and to maintain consistent quantity and quality of water within the municipal watershed over approximately 61,395 acres. Proposed treatments to address the ongoing Mountain Pine Beetle (MPB) epidemic and to reduce the risk of post wildfire effects to the watershed that could occur in the roadless expanse include Improvement Harvest, Low Severity Prescribed Fire, Low Severity Grassland Prescribed Fire, Mixed Severity Prescribed Fire, Pre-commercial Thin, Private Land Buffers, Regeneration Harvest and Shaded Fuel Breaks.

Concern was raised by the public during scoping that the proposed treatment activities within the roadless expanse will degrade roadless area characteristics, which could then preclude further consideration of the areas for potential recommended wilderness designation. The areas of greatest concern are related to the proposed treatments that would mechanically treat areas and result in the cutting, sale, or removal of trees within the roadless expanse or would result in the construction or reconstruction of roads.

The Roadless Area Conservation Rule (RACR 2001) prohibits road construction and road reconstruction in IRAs on National Forest System lands, except under limited circumstances. The RACR has prohibitions on timber harvesting within IRAs. As stated in the Preamble of the Rule, “the cutting, sale, or removal of trees must be clearly shown through project level analysis to contribute to the ecological objectives described in 36 CFR 294.13(b)(1), or under the circumstances described in paragraphs (b)(2) through (b)(4). Timber may be cut, sold, or removed in inventoried roadless areas if the Responsible Official determines that one of the following circumstances exists.

(b)(1).The cutting, sale, or removal of generally small diameter timber is needed for one of the following purposes and will maintain or improve one or more of the roadless area characteristics as defined in 36 CFR 294.11.

- i. To improve threatened, endangered, proposed, or sensitive species habitat.
- ii. To maintain or restore the characteristics of ecosystem composition and structure, such as to reduce the risk of uncharacteristic wildfire effects, within the range of variability that would be expected to occur under natural disturbance regimes of the current climatic period.

(b)(2).The cutting, sale, or removal of timber is incidental to the implementation of a management activity.

(b)(3).The cutting, sale, or removal of timber is needed and appropriate for personal or administrative use, as provided for in 36 CFR part 223.

contained in Forest Service Roadless Area Conservation, Final Environmental Impact Statement, Volume 2, dated November 2000.

(b)(4). Roadless characteristics have been substantially altered in a portion of an inventoried roadless area due to the construction of a classified road and subsequent timber harvest. Both the road construction and subsequent timber harvest must have occurred after the area was designated an inventoried roadless area and prior to January 12, 2001. Timber may be cut, sold, or removed only in the substantially altered portion of the inventoried roadless area.

The anticipated effects of treatments that allow cutting of small diameter trees in roadless areas in the Tenmile – South Helena project area are expected to be within the exceptions identified above. Management activities focus on removal of timber and prescribed burning that is aimed at reducing the risk of uncharacteristic wildfire effects²¹, meeting (b)(1)(ii) in the list above.

The effects to the roadless expanse were analyzed using qualitative indicators. The indicators used are the five principal wilderness attributes of potential wilderness areas, as cited in Forest Service Handbook 1909.12. The existing condition of the potential wilderness attributes of IRAs is described, as documented in Appendix C of the Helena National Forest Plan Environmental Impact Statement (HNF Plan EIS, 1986). Specialists then analyzed the effect of the action alternatives on each of these attributes.

Judicial actions have also required the Forest Service to consider IRAs not in isolation, but in combination with contiguous roadless lands adjacent to IRAs. Both the IRAs and roadless areas adjacent to the IRAs are referred to as the “roadless expanse” and consequently, effects to the roadless expanse are analyzed in this report. This project does not propose any new road construction or road reconstruction in the roadless expanse. Both of the action alternatives would be compliant with the Roadless Area Conservation Rule, which establishes prohibitions on road construction and road reconstruction in IRAs on National Forest Service System lands.

Assumptions

It is assumed the anticipated effects of treatments that allow cutting of generally small diameter trees in roadless areas in the Tenmile – South Helena Project are expected to comply the RACR and be within the exceptions identified in 36 294.13(b)(1) and/or in paragraphs (b)(2) through (b)(4). It is assumed that such management activities focus on thinning of generally small diameter trees and prescribed fire that is aimed at restoring the characteristics of ecosystem composition and structure, such as to reduce the risk of uncharacteristic wildfire effects, within the range of variability that would be expected to occur under natural disturbance regimes of the current climatic period.

²¹ The effects of uncharacteristic wildfires often include unnatural increases in wildfire size, severity, and resistance to control and the associated impacts to people and property. These uncharacteristic effects have been caused primarily by past wildfire suppression, and past timber harvesting and grazing practices. These have contributed to often-dramatic changes in some areas in wildfire frequency, size, and severity (Roadless Area Conservation FEIS, 2000, Vol. 1, 3–72 to 3–73). The vegetative structure, density, and composition of these areas have changed when compared to less altered ecosystems (Roadless Area Conservation FEIS, 2000, FEIS Vol. 1, 3–144).

Information Used

Analysis of the roadless expanse resource relies on information included in the 1986 Helena Forest Plan, in other resource reports for this project and from relevant data layers from the Helena National Forest including trails, roads, recreation sites, inventoried roadless areas, ROS classes, winter use and management areas. A review of existing law, regulation and policy relevant to roadless areas was conducted and relevant sections of the Helena Forest Plan, FSH 1909.12 Chapter 70 and the Roadless Area Conservation Rule were used to help guide the analysis.

Methodology

Treatment activities as identified in the action alternatives are evaluated in relation to their effects on each roadless expanse (Lazyman Gulch and Jericho Mountain). The analysis discloses potential effects to roadless area characteristics and wilderness attributes from the Tenmile – South Helena Project proposed treatment activities in order to determine if, or to what extent these effects might influence future consideration for wilderness recommendations.

The roadless expanse for project analysis was determined through Geographic Information Systems (GIS) by overlaying the Helena National Forest roads layer with the two IRA layers to identify unroaded polygons adjacent to the Jericho Mountain and the Lazyman Gulch IRAs. The protocol used to identify roadless expanse was to include openings between roads of at least ½-mile span and unroaded polygons of at least 100 acres. These sizes were chosen because of the loss of opportunities for solitude and primitive recreation opportunities below these thresholds. Solitude is a personal, subjective value defined as the isolation from sights, sounds, and presence of others and from developments and evidence of humans (USDA 2010, Our Approach to Roadless Area Analysis And Analysis of Unroaded Lands Contiguous to Roadless Areas). Soundscape research in Rocky Mountain National Park suggests visitors travel an average of at least a half mile from common noise factors in order to reach natural quiet (Park et. al. 2009). The resulting roadless expanse is the direct, indirect and cumulative effects boundary for the analysis.

This analysis focuses on the potential effects of project activities on roadless characteristics as defined in 36 CFR 294 Subpart B 294.11 – Roadless Area Conservation, Final Rule and wilderness attributes as defined in the 1964 Wilderness Act and Forest Service Handbook (FSH) 1909.12 (72.1).

Table 231 shows the crosswalk or relationship between the wilderness attributes identified in Forest Service Handbook 1909.12 and the roadless area characteristics defined in the 2001 Roadless Area Conservation Rule (36 CFR Subpart B 294.11). The wilderness attributes and associated roadless characteristics are used to compare the effects of the proposed treatment activities on wilderness quality of each roadless expanse in the project area.

Table 231. Wilderness attributes and roadless characteristics crosswalk

Wilderness Attributes	Roadless Characteristic
Natural: Extent to which the area's ecological systems are substantially free from the effects of modern civilization and generally appear to have been affected primarily by forces of nature.	High quality or undisturbed soil, water, and air. Source of public drinking water. Diversity of plant and animal communities. Habitat for threatened, endangered, proposed, candidate, and for sensitive species dependent on large, undisturbed areas of land.
Undeveloped: Degree to which the area is without permanent improvements or human habitation.	Natural appearing landscapes with high scenic quality. Reference landscapes of relatively undisturbed areas.
Solitude and Primitive Recreation: Personal subjective value defined as the isolation from the sights, sounds, and presence of others and the developments of man	Primitive, semi-primitive non-motorized, semi-primitive motorized ROS classes of dispersed recreation.
Special Features: Unique and/or special geological, biological, ecological, cultural, or scenic features.	Other locally identified unique characteristics, traditional cultural properties and sacred sites.
Manageability/boundaries: Ability to manage a roadless area to meet the minimum size criteria (5,000 acres) for wilderness.	No criteria

Spatial and Temporal Context for Effects Analysis

The potential direct and indirect effects to roadless resources were considered within the roadless expanse. The direct effects would be short-term and temporary, occurring during project implementation. The long-term indirect effects would be related to ecosystem restoration, changes in visual qualities, and other items within the project area that would influence several of the area's roadless characteristics.

The temporal bounds of the roadless effects analysis are generally dependent on the lasting effects of project activities. Effects can be either short-term in nature or long-term. Short-term effects are impacts from project activities that are expected to last up to 5 years. These would include disturbances associated with implementation of the proposed activities as well as impacts that would endure beyond implementation, up to five years. Long-term effects are those projected to endure beyond 5 years.

Roadless Expanse, Affected Environment

Introduction

Comments received from scoping identified several issues related to roadless areas. Overall, the issues focused on whether or not the project conforms to the Roadless Area Conservation Rule. Concern was raised by the public during scoping that the proposed treatment activities within the roadless expanse will degrade roadless area characteristics, which could then preclude further consideration of the areas for potential recommended wilderness designation. The areas of greatest concern are related to the proposed treatments that would mechanically treat areas and result in the cutting, sale, or removal of trees within the roadless expanse or would result in the construction or reconstruction of roads. Over-all, there is concern that the proposed treatment activities are compliant with the Roadless Area Conservation Rule (RACR) which prohibits road construction, reconstruction, and timber harvest in IRAs "because they have the greatest likelihood of

altering and fragmenting landscapes, resulting in immediate, long-term loss of roadless area values and characteristics.” (RACR 2001). The issue and issue indicator that follows helps to address whether or not the project conforms to the Roadless Area Conservation Rule.

Issue

- Impacts of mechanized treatments and prescribed fire on wilderness attributes and roadless area characteristics within the project area.

Issue Indicator

- Acres affected and duration of the impact on roadless area characteristics and wilderness attributes (see Table 231 – Wilderness Attributes and Roadless Characteristics Crosswalk)

Analysis Area

The analysis area includes the Jericho Mountain and Lazyman Gulch Inventoried Roadless Areas (IRAs) and the unroaded lands to the southwest of the Jericho Mountain IRA. This entire area is referred to as the roadless expanse. The unroaded lands to the southwest of Jericho Mountain IRA has a contorted and amorphous form. This unroaded area does have past harvest history and is primarily located within T-1 management area.

The Jericho Mountain IRA is 8,440 acres and the Lazyman Gulch IRA is 11,605 acres in size. Approximately 80 percent or 6,735 acres of the Jericho Mountain IRA lies within the project boundary. The unroaded lands adjacent to the Jericho Mountain IRA are approximately 750 acres and are located outside the project boundary. The entire Lazyman Gulch IRA lies within the project boundary. Private land inholdings are located within both IRAs and are not accounted for in the above IRA data.

Though 20 percent of the Jericho Mountain IRA and the adjacent unroaded area fall outside of the project area, sounds and activities occurring in the project area could impact the entire roadless expanse. Soundscape research in Rocky Mountain National Park suggests visitors travel an average of at least a half mile from common noise factors in order to reach natural quiet (Park et. al. 2009). There could also be visual or smoke-related impact of the project activities on a visitor recreating in the roadless expanse.

The temporal bounds of the roadless expanse effects analysis are generally dependent on the lasting effects of project activities. Effects can be either short-term in nature or long-term. Short-term effects are impacts from project activities that are expected to last up to 5 years. These would include disturbances associated with implementation of the proposed activities as well as impacts that would endure beyond implementation, up to five years. Long-term effects are those projected to endure beyond 5 years.

Existing Condition

Jericho Mountain Roadless Expanse

The Jericho Mountain Roadless Expanse is approximately ten air miles southwest of Helena, Montana. The area lies on both sides of the Continental Divide but only the portion east of the Divide is located within the project area boundary. The Jericho

Mountain Roadless Expanse is also located in portions of both Lewis and Clark and Powell Counties. Access is provided at many points along the Tenmile, Minnehaha, and Bryan Creek Roads. Trail #337, which originates at MacDonald Pass, and is maintained for approximately two miles south along the Continental Divide.

The area itself is a rectangular-shaped area running seven miles north-south and ranging in width from one-to-four miles. The Continental Divide runs north-south through the area. The two-thirds of the roadless area that is east of the Divide is part of the Tenmile municipal watershed.

The northern boundary runs east from MacDonald Pass, along U.S. Highway 12. The eastern boundary runs south along the Tenmile and Minnehaha Creek road. The southern boundary is defined by Bryan Creek. The western boundary turns north to Jericho Mountain, and then follows the Continental Divide and private land to MacDonald Pass.

Vegetation is principally lodgepole pine, varying from lodgepole pine-Douglas fir with scattered small rough fescue openings along the western slopes, to lodgepole pine-alpine fir along the Continental Divide. Please refer to the Tenmile – South Helena Forested Vegetation Report for information regarding forested vegetation existing condition and the Tenmile – South Helena Fire and Fuels Report for further information regarding fire and fuels existing condition.

Topography changes from the 5,200 foot valley floor to steep 25-60 percent slopes, to rolling 0-25 percent slopes at 7,300 feet along the Continental Divide. Annual precipitation is about 25 inches. Habitat types are Douglas fir/pinegrass, Douglas fir/Idaho fescue, and subalpine fir/grouse whortleberry.

Wildlife species include elk, moose, black bear, mule deer, grouse, and numerous nongame animals and birds. All streams flow intermittently. Residents of Rimini, Helena, and Elliston use the area for wood gathering and hunting. Roads and ground disturbance from past and present mining is prevalent, providing a vector for authorized, and in some cases, unauthorized motorized four wheel drive access throughout the area. Some primitive motorized and non-motorized recreation activities occur in the area. Please refer to the Tenmile-South Helena Recreation Report regarding existing condition for recreation resources.

The Jericho Mountain Roadless expanse is mostly natural appearing, with a moderate level of scenic integrity. There is evidence of human activity in the expanse, including scattered historic mining sites with accompanying access roads. Two cabins are present in the roadless area, which detract somewhat from the undeveloped integrity of the expanse along with one private land inholding located within the adjacent unroaded land. The roadless expanse- both the Jericho Mountain IRA as well as the adjacent unroaded lands to the southwest of it - contains many access spur roads. There are also many roads around the edges of the roadless expanse. The relatively high concentration of roads on the landscape has a negative impact on the naturalness of the roadless expanse. The Jericho Mountain IRA is not proposed wilderness under the Helena National Forest 1986 plan.

Roadless Area Characteristics and Wilderness Attributes:

The descriptive paragraphs below are from the analysis of roadless lands conducted by the Helena National Forest in 1986 during development of the Forest Plan. Following those paragraphs are descriptions of activities and changes that have occurred since the Forest Plan was developed.

Natural – *The extent to which long-term ecological processes are intact and operating.*

The Forest Plan was silent on long term ecological processes. However, due to the MBP epidemic and decades of fire suppression, the current state of this attribute is degrading.

Undeveloped – *The degree to which development and uses are apparent to most visitors.*

The impact of human activity is present on much of the area; however, most impacts are old and blend in with the landscape. Past mining has created access roads throughout the area. Some roads have naturally revegetated while others forest service system roads provide yearlong motorized access through part of the roadless expanse and access to private land. Two patented mining claims with cabins, and several unpatented claims are scattered throughout the area. The northern boundary is adjacent to US Highway 12; the east and south sides are bordered by the Tenmile-Minnehaha Road, which accesses the Forest and a residential subdivision. An active grazing allotment, which is fenced, exists on the north end. Persons traveling along the higher open ridges at the north end can see human activities and development within the adjacent areas. The unroaded area adjacent to the IRA, included in the roadless expanse analysis area, is located west of the Continental Divide and outside the project area. This area contains a private land inholding and also has a history of extensive mining that's effects are evident on the landscape. There are patented mining claims that now have structures for private use. Bounding roads in this area have seasonal restrictions that also access private inholdings. Communication towers located on MacDonald Pass can be seen from numerous higher elevation points (mountain tops) within the roadless expanse and the presence of the Yellowstone Pipeline is evident immediately adjacent to the northern boundary.

Opportunities for Solitude and Primitive and Unconfined Recreation - *Solitude is a personal, subjective value defined as the isolation from sights, sounds, and presence of others and from developments and evidence of humans. Primitive recreation is characterized by meeting nature on its own terms, without comfort and convenience of facilities.*

The Jericho Mountain roadless expanse is described in Appendix C of the Forest Plan (USDA 1986a) as having “potential for solitude on pockets of forested slopes”. Because of its long, narrow shape, the area has limited potential for the visitor to experience a vastness of scale, as the area is only approximately one mile wide from its core to either side. This limits the opportunity to experience isolation from sights, sounds, and the presence of others. The Continental Divide creates topographic screening.

The majority of recreation use occurs in fall and early winter with wood gathering and hunting, though the area is used year-round due to proximity to Helena and surrounding communities. Skiing and snowmobiling are popular and in more recent year, mountain biking has become a popular activity along the Continental Divide trail #337 and

switchback trail #348. The Tenmile picnic area and Moose Creek Campground are located just outside the boundary on the north. The Continental Divide National Scenic Trail runs the length of the area.

Special features and values – *Unique ecological, geographical, scenic, and historical features of an area*

There are 8 identified historical/cultural sites and 2 historic mining districts (Rimini District and Helena District) within the entire roadless expanse (both Jericho Mountain and Lazyman Gulch).

Manageability – *The ability to manage an area for wilderness consideration and maintain wilderness attributes.*

The northern boundary of the Jericho Mountain roadless expanse runs east from MacDonald Pass along US Highway 12. The eastern boundary then runs south along the Tenmile and Minnehaha Creek roads. The southern boundary is defined by Bran Creek, and the western boundary turns north to Jericho Mountain, and then follows the Continental Divide and private land back to MacDonald Pass.

Although most of the boundary is well defined by roads and topographic breaks, approximately 10 percent of it would be difficult to describe and locate on the ground, as it is located midslope. In addition, there are private lands within the area with existing access roads (much of which are old mining roads). These roads present a wilderness manageability challenge, as they would be essentially impossible to close without acquiring the private lands.

Lazyman Gulch Roadless Expanse

The Lazyman roadless expanse consists of the Forest Service lands within the IRA boundary. The area is approximately five air miles southwest of Helena in Lewis and Clark and Jefferson Counties. The west side is accessible by a major gravel road and the south by a four wheel drive road. There is no public access from the north because of private land. The area is five miles from north to south and two to six miles from east to west.

The northern boundary runs along private land. The eastern boundary is defined by the road to Park City and the Travis Creek road. The southern boundary runs just south of Black Mountain and then turns north along the Tenmile Creek road. The Lazyman Gulch is excluded because of existing development. Elevation varies from approximately 4,800 feet on the north end to 7,223 feet on Colorado Mountain, the highest point. Major topographic features besides Colorado Mountain are Black Mountain and Black Hall Meadows. The majority of the IRA is located within the City of Helena's municipal watershed.

Vegetation varies from Douglas fir at the lower slopes and dry south-southwest aspects to subalpine fir and spruce on the north facing slopes. Portions of the area covered with lodgepole pine are undergoing a successional change to the climax subalpine fir-spruce habitat types. Wildlife species include elk, moose, black bear and mule deer. Timber was harvested for mining and homesteading in the late 1800s. Please refer to the Tenmile –

South Helena Forested Vegetation Report for information regarding forested vegetation existing condition and the Tennmile – South Helena Fire and Fuels Background Report for further information regarding fuels and fire existing condition description.

The Lazyman Gulch roadless expanse is similar to the Jericho roadless expanse in regards to natural appearing, with a moderate level of scenic integrity. There is evidence of human activity in the roadless expanse, including scattered historic mining sites with accompanying access roads. The area is not remote and is influenced by external activities such as close proximity to highways and associated noise. The Lazyman Gulch roadless expanse is not proposed wilderness under the Helena National Forest 1986 plan.

Roadless Area Characteristics and Wilderness Attributes:

The descriptive paragraphs below are from the analysis of roadless lands conducted by the Helena National Forest in 1986 during development of the Forest Plan. Following those paragraphs are descriptions of activities and changes that have occurred since the Forest Plan was developed.

Natural – *The extent to which long-term ecological processes are intact and operating.*

The Forest Plan was silent on long term ecological processes. However, due to the MBP epidemic and decades of fire suppression, the current state of this attribute is degrading. Some human manipulation has occurred in the form of vegetation treatments over the past several decades.

Undeveloped – *The degree to which development and uses are apparent to most visitors*

The draws and stream courses have all been heavily explored for minerals in the past. Horse trails have been constructed throughout the area for logging and mining. Several range improvements for two range allotments are scattered in the area. Housing developments, agricultural activities, roads and timber harvest are all easily visible from the high points.

Opportunities for Solitude and Primitive and Unconfined Recreation - *Solitude is a personal, subjective value defined as the isolation from sights, sounds, and presence of others and from developments and evidence of humans. Primitive recreation is characterized by meeting nature on its own terms, without comfort and convenience of facilities.*

The area can provide the visitor with the sense of solitude. The diverse topography and dense tree cover can easily screen people from one another in short distances. The area is dissected with tributaries of Colorado Gulch and Tennmile Creek. The area is one mile from a major highway to the north and adjacent to a heavily used road to the west. Sounds from human activity near the periphery can penetrate most of the roadless expanse area. In 1984 the IRA portion of the roadless expanse was closed to motorized recreation. Non-motorized recreation includes big game hunting, day hiking, and cross-country skiing.

Special features and values – *Unique ecological, geographical, scenic, and historical features of an area*

There are 8 identified historical/cultural sites and 2 historic mining districts (Rimini District and Helena District) within the roadless expanse (both Jericho Mountain and Lazyman Gulch combined).

Manageability – *The ability to manage an area for wilderness consideration and maintain wilderness attributes.*

The area is not remote and is influenced by external activities. Approximately 540 acres of private land exist within the roadless area. Public access from the north is restricted by private landowners adjacent to the roadless area. Conflicts with private land within the roadless boundary probably cannot be avoided. Historically the area has been heavily mined and most of the private land was acquired by patented mining claims.

Past Activities in Roadless Expanse

Since the 1986 analysis of roadless lands, the Helena National Forest, consistent with Forest Plan direction, has continued harvest and fuels activities within the roadless expanse, as shown in Table 232 that follows. These activities have contributed to some evidence of human access within the roadless expanse; however, the area generally retains the undeveloped characteristics described above. Approximately 1 percent or less of each roadless expanse (Jericho Mountain and Lazyman Gulch) has been affected by these actions in terms of acreage.

Table 232. Past harvest and fuel activities in the roadless expanse

Activity	Jericho Mountain Acres	Lazyman Gulch Acres
Burning of piled material	14.2	.1
Fuel Break	--	5
Compacting/crushing of Fuels	5.9	
Piling of Fuels, hand or machine	15.1	18.5
Broadcast Burning		14.5
Rearrangement of Fuels	.9	
Precommercial Thin		18.2
Commercial Thin	--	3
Sanitation Cut	.9	--
Stand Clearcut	5.9	32.6
Single tree selection cut	--	2.3
Total Acres	42.9	94.2

Existing Roads

Many of the roads mentioned in Appendix C of the 1986 Helena National Forest Plan have since been decommissioned, converted to trails, or gated. Some of the gated roads provide administrative emergency access for fire suppression and are also available for motorized use to access private property but are otherwise available for hiking and bicycling. A short portion of one road (1880) passes through the Lazyman Gulch roadless expanse for a short distance (.35 miles) before accessing private property. In the Jericho Mountain roadless expanse, a main road (1864, 3.60 miles) is used by the public. Segments near the Continental Divide are slated to become part of the Continental Divide National and Scenic Trail, though it will still be available for motorized use. Roads 1863 and 1863-E1 dissect the Jericho Mountain roadless expanse along the Continental divide and road 527-B1 dissects the southwestern end of this roadless expanse. These roads all provide access to private property along with fire suppression access within the roadless expanse. A list of these and additional roads located in the roadless expanse are provided below.

The high tree mortality, due to the mountain pine beetle outbreak, has resulted in abundant personal use firewood cutting opportunities along road corridors in the project area. Firewood cutting has shown to contribute to initiating unauthorized route development as gathers' tend to drive off of designated routes in order to collect the firewood. This is known to occur in areas within the roadless expanse where existing roads are present.

Table 233. Current Roads in Lazyman Gulch IRA

Road ID	Road Name	IRA	Miles of road in Roadless Expanse
1813	Lazyman Gulch	Lazyman Gulch	0.17
1880	Spur	Lazyman Gulch	0.35
299 C-1	Beaver Spur	Lazyman Gulch	0.13
4177	Colorado Mountain	Lazyman Gulch	1.06
Total mile of road in Lazyman Gulch IRA			1.71

Table 234. Current roads in Jericho Mountain Roadless Expanse

Road ID	Road Name	Roadless Expanse	Miles of road in Roadless Expanse
1864	Bear Gulch	Jericho Mountain	3.60
1864 A-1	Bear Gulch A-1	Jericho Mountain	0.28
1863	Bullion Parks	Jericho Mountain	1.71
1863-E1	Bullion Park Spur	Jericho Mountain	.76
1856 H-1	North Fork Mike Renig Gulch	Jericho Mountain	1.08
527 B-1	Beatrice Mine	Jericho Mountain	1.34
527 C-1	Minnehaha Spur	Jericho Mountain	0.98
Total mile of road in Jericho Mountain Roadless Expanse			9.75

Roadless Expanse, Environmental Consequences

Introduction

The Tennile – South Helena Project proposes the following treatment within the roadless expanse (Table 235 and Table 236): Improvement Harvest, Low Severity Prescribed Fire, Low Severity Grassland Prescribed Fire, Mixed Severity Prescribed Fire, Pre-commercial Thinning, Private Land Buffers, Regeneration Harvest, and Shaded Fuel Breaks. The amount and application of treatment type and treatment method varies between alternatives.

The effects of each alternative are analyzed in reference to the measurement indicator: Acres affected and duration of the impact on roadless area characteristics and wilderness attributes.

Table 235. Treatment type and acres within the roadless expanse per action alternative ²²

Treatment Type	Alternative 2: Proposed Action			Alternative 3		
	Jericho Mtn.	Lazyman Gulch	Total	Jericho Mtn.	Lazyman Gulch	Total
Improvement Harvest	0	68	68	0	0	0
Low Severity Prescribed Fire	1,582	2,389	3,971	279	1,297	1,576
Low Severity Grassland Prescribed Fire	0	0	0	0	946	946
Mixed Severity Prescribed Fire	1,101	612	1,713	314	311	625
Pre-commercial Thin	6	31	37	0	31	31
Private Land Buffers	41	513	554	77	563	640
Regeneration Harvest	199	73	272	0	0	0
Shaded Fuel Break	1,015	306	1,321	792	292	1,084
Grand Total	3,944	3,992	7,936	1462	3,440	4,902

²² Only includes treatment acres on Forest Service land.

Table 236. Description of treatment methods in roadless expanse (RE) per action alternative ²³

Tenmile – South Helena Alternative 2: Proposed Action				
Method of Treatment	Proposed Treatment Type (acres)	Acres in RE/IRA	% of Jericho RE affected by proposed actions	% of Lazyman Gulch IRA affected by proposed actions
Commercial Harvest with prescribe Fire	6,922	340	2% (199)	1% (141)
Mechanical rearrangement of fuels with prescribe fire ²⁴	15,824	4,344	17% (1,503)	24% (2,841)
Total acres of treatment	23,290	7,936	47% (3,992)	34% (3,992)
Tenmile – South Helena Alternative 3				
Method of Treatment	Proposed Treatment Type (acres)	Acres in RE/IRA	% of Jericho RE affected by proposed actions	% of Lazyman Gulch IRA affected by proposed actions
Commercial Harvest with prescribe Fire	3,831	0	0% (0)	0% (0)
Mechanical rearrangement of fuels with prescribe fire ⁵	9,550	640	<1% (77)	5% (563)
Total Acres of Treatment	17,094	4,902	17% (1,462)	30% (3,440)

Effects Common to All Action Alternatives

Both action alternatives propose methods of vegetation treatments within the roadless expanse. Each alternative would have some short-term adverse effect to the undeveloped and natural attributes of the area, but would result in a long-term beneficial effect. The differences between alternatives lies in the amount and type of treatment as well as methods employed. In alternative 3, no mechanized treatment or commercial harvest within the roadless expanse, the exception to this is that mechanized treatments is proposed within private buffer units.

Under both action alternatives, 6.78 miles of roads in the Jericho Mountain roadless expanse and 1.22 in the Lazyman Gulch roadless expanse (Table 237) would be decommissioned. Decommissioning would include full obliteration of the road:

²³ Refers to units with proposed treatments that would be implemented using a combination of hand and mechanical methods. Mechanical methods would be favored but where not feasible (i.e. on steep slopes) hand methods would be used. Analysis for these types of units considered the entire unit as mechanical so, effects within these units could be less than what is indicated in various resource sections under chapter 3 of this DEIS.

²⁴ Refers to units with proposed treatments that would be implemented using a combination of hand and mechanical methods. Mechanical methods would be favored but where not feasible (i.e. on steep slopes) hand methods would be used. Analysis for these types of units considered the entire unit as mechanical so, effects within these units could be less than what is indicated in various resource sections under chapter 3 of this DEIS.

recontouring (returning the road prism to natural contour), removing culverts, replacing topsoil, placing woody debris upon the disturbed area to provide stability, and seeding the disturbed area. During implementation, these activities would have a short term adverse effect on the natural attributes of the area, but would, over time, reduce the amount of roads in the area and provide a more natural and undeveloped state in the roadless expanse. Opportunities for primitive and unconfined recreation opportunities as well as for solitude would increase and there would be better management of unauthorized motor vehicle use.

Table 237. Proposed decommissioned roads in roadless expanse, alternatives 2 and 3

Proposed Decommissioned Roads in Lazyman Gulch Expanse			
Road ID	Road Name	Roadless Expanse	Miles
1813	Lazyman Gulch	Lazyman Gulch	0.03
299 C-1	Beaver Spur	Lazyman Gulch	0.13
4177	Colorado Mountain	Lazyman Gulch	1.06
Total: Proposed Decommissioned Roads in Lazyman Gulch Roadless Expanse			1.22
Proposed Decommissioned Roads in Jericho Mountain Roadless Expanse			
1863	Bullion Parks	Jericho Mountain	0.49
1864	Bear Gulch	Jericho Mountain	3.69
1864 A-1	Bear Gulch A-1	Jericho Mountain	0.28
527 B-1	Beatrice Mine	Jericho Mountain	1.34
527 C-1	Minnehaha Spur	Jericho Mountain	0.98
Total: Proposed Decommissioned Roads in Jericho Mountain Roadless Expanse			6.78
Grand Total: Proposed Decommissioned Roads in the entire Roadless Expanse			8.00

Alternative 1, No Action

Direct/Indirect Effects

This alternative would not implement any of the management activities proposed in the action alternatives. Any direct or indirect effects of this alternative would be the result of continued MPB outbreak in the area. Consequently, fuel loading would continue to increase over the project area, as MPB-killed trees would continue to fall. This would create an increased risk of wildfire and to firefighter and public safety. The potential event of an uncharacteristic fire could impact the naturalness and/or recreation values in the area. There would be no immediate direct effects; indirect effects are discussed below in terms of wilderness attributes and associated roadless characteristics. Not conducting treatments within the roadless expanse would not only put at risk the important values and critical infrastructure this project is design to address but, it would also limit the opportunities to manipulate fuels structure to improve conditions for public and firefighter safety across the landscape. In the event of a wildfire within the roadless expanse, fire management staff would limit and/or restrict ground crews due to safety concerns related to snags and inadequate escape routes to safety zones because of the continuous layers of fallen dead trees. Furthermore, the probability of successfully protecting important values and infrastructure such as the municipal watershed (which

makes up approximately 30 percent of the roadless expanse), public safety and property, soil and water resources and wildlife habitat would be low.

Natural – *The extent to which long-term ecological processes are intact and operating*

Fire would not be reintroduced to the landscape under this alternative. This is a fire-adapted ecosystem, and the continuation of fire suppression and potential for more intense wildfire instead of mosaic burns that historically occurred here would contribute to the degradation of the natural attribute. However, no further manipulation of the environment would occur.

Undeveloped – *The degree to which development and uses are apparent to most visitors*

Since no treatments would occur, there would be no affect to this attribute.

Outstanding opportunities for solitude or primitive unconfined recreation – *Solitude is a personal, subjective value defined as the isolation from sights, sounds, and presence of others and from developments and evidence of humans. Primitive recreation is characterized by meeting nature on its own terms, without comfort and convenience of facilities.*

The existing condition for solitude would not be immediately affected under this alternative. However, over time conditions could become challenging for visitors to recreate due to fuel loading from MBP and associated downfall. This could increase opportunities for solitude for those who are able and willing to negotiate an increasingly brushy and inaccessible area. However, sight distances would also decrease from defoliation and loss of trees in the continuing MBP epidemic. In addition, large wildfires could dramatically change the landscape, also changing how people access or recreate in the roadless expanse. Conversely, no road decommissioning would occur under this alternative, therefore opportunities for primitive and unconfined recreation as well as for solitude would not increase, and management of unauthorized motor vehicle use would not be improved. Trails could become impassable and favorite campsites inaccessible due to fallen trees. In the case of a large fire, sight distance and topography screening could be changed for decades, impacting solitude, as sights and sounds of visitors in the area as well as activities on adjacent lands would more easily be seen and heard. In addition, impacts of a large wildfire would include presence of crews, helicopters and possibly machinery for long periods of time, until suppression goals were achieved.

Special Features

The existing identified historical sites would not be affected under this alternative.

Manageability

Choosing the no action alternative would not change the manageability of the area and would not improve management of unauthorized motorized vehicle use.

Irreversible and Irretrievable Commitments

There would be no irreversible or irretrievable commitments of roadless resources under alternative 1. However, the likelihood of an uncharacteristic wildfire³ is high, exposing

project area resources, facilities, and human uses at risk to irreversible or irretrievable outcomes.

Cumulative Effects

Analysis of cumulative effects on roadless and unroaded resources considers the effects of past, present, and reasonably foreseeable future activities on the potential wilderness attributes of these lands. The spatial boundary for the actions considered in cumulative effects is the project boundary plus the entirety of the Jericho Mountain and Lazyman Gulch roadless expanses. Activities undertaken or not undertaken in any part of the roadless expanse could, when considered with Tenmile-South Helena project activities, combine to have an impact on the roadless expanse's wilderness potential. Some types of activities on lands adjacent to the roadless expanse could have an impact on their wilderness potential as well, in terms of noise or scenic value. Actions considered date back to pre-1960 that are known, and date forward to all reasonably foreseeable planned future activities (see appendix B of this report located in the project record). They include prescribed burning, road and trail maintenance, recreational use, mining, and private land development. The Telegraph Vegetation Project, with proposed implementation in 2016, is particularly applicable to this project, since it proposes three burn units within the Jericho roadless expanse on the other side of the Continental Divide (11 percent of the roadless expanse would be in that project area).

Past timber harvesting and road construction contributed to the existing condition of the roadless expanse, creating an area where human activity is evident, and there is only moderate existing potential for most wilderness attributes. The cumulative effect of the no action alternative, by not addressing the MPB outbreak, when considered with the past present and reasonably foreseeable future actions in and around the roadless expanse, could negatively impact their wilderness potential. Increased risk of uncharacteristic wildfire³ may impact their primitive recreation potential.

Alternative 2

Direct and Indirect Effects

For a complete discussion of the expected impacts of alternatives 2 and 3 on potential wilderness values in the analysis area, see Appendix A: Wilderness Qualities or Attributes Worksheet in the Roadless Expanse Report. This worksheet contains analyses from resource specialists concerning the impact of the action alternatives on potential wilderness values, such as those involving botanical, wildlife, soils, or hydrological resources. The summaries below are drawn from those specialist analyses in the worksheets.

47 percent of the Jericho Mountain roadless expanse and 34 percent of the Lazyman Gulch roadless expanse would fall under some type of treatment under this alternative. The remainder of the Jericho Mountain and Lazyman Gulch roadless expanse would not be treated. The risk of uncharacteristic wildfire³ would be reduced in those areas because the ability for fire to spread across the landscape would be hampered due to adjacent areas where treatments are proposed (see the Tenmile – South Helena Fire and Fuels

report). This being said, there would still be an effect to naturalness in the untreated areas similar to alternative 1 but at a lesser extent.

Natural – *The extent to which long-term ecological processes are intact and operating*

Reintroducing fire into this fire adapted ecosystem would begin reversing the trends caused from past fire suppression and reduce the risk of large, uncharacteristic wildfires³. This would enhance the characteristic of “naturalness” throughout the area, by establishing forest characteristics that would have been more typical of this area if fire had been allowed to play its natural role in landscape processes.

Prescribed fire and associated treatments are a form of “modern human control or manipulation” and would to some extent affect the “untrammeled” and natural character within the roadless areas. There is disagreement about whether the effects of additional management actions such as prescribed fire (i.e. trammeling) to correct the effects of previous management actions such as the suppression of natural fire (i.e.: trammeling) is appropriate (Yung, undated). In general, the presence of nearby communities, sensitive water supplies, and the effects of climate change often tend to tip the balance toward some type of treatment.

Using low and mixed severity burning would mimic a wildfire within its natural regime as opposed to an unnaturally intense wildfire that could result in detrimental effects to the watershed, thereby enhancing or helping to maintain the roadless characteristic of natural appearing landscapes. In contrast, the areas untreated could stand out to visitors when compared with the treated areas. However, design criteria such as blending unit edges would be used to mitigate this effect (see the project’s Scenery Specialist report).

In the long term the proposed action would enhance or help to maintain the roadless resources including high quality soil, water and air; diversity of plant and animal communities; and habitat for threatened, endangered, proposed, candidate, and sensitive species, and for those species dependent on large, undisturbed areas of land. See additional discussion of the roadless resources in this report’s Appendix A: Tenmile – South Helena Project Roadless Characteristics Worksheet.

Undeveloped – *The degree to which development and uses are apparent to most visitors*

Short-term direct impacts would be expected from prescribed fire treatments. The hand prescribed fire control lines would create a linear disturbance within the roadless area. Stumps from the hand slashing of generally small diameter trees may remain visible for several seasons following the prescribed fire, which may detract from the undeveloped character for visitors traveling through the roadless area. The hand prescribed fire control lines and control lines could encourage unauthorized motorized use until they are naturally revegetated. Blackened trees from the prescribed burning would be noticeable; however, fire is a natural process and should not affect the roadless integrity. Piles would be noticeable to visitors until the piles were able to be burned, which the timing of would be dependent on the prescribed fire parameters and air quality concerns. However, smoke impacts would be considerably less than those expected from an unplanned wildfire.

The use of mechanical equipment and motorized vehicles on-trails as well as off-trails through the forest is highest under this alternative. Impacts would be more obvious in the

short-term and would include incidental removal of some vegetation for passage, skid trails, tracks of egress and ingress, and brushing and limbing on trail #348. These short-term impacts would most likely not occur on the entire trail where it passes through treatment units. Instead, mechanical equipment and motorized vehicles would utilize the trail only in select locations while other portions of the trail could be treated via hand methods or could receive no treatment. The same short-term effect would also be evident in areas off-trail where mechanized equipment would travel through the forest, intermittently connecting to trails, then back into the forest again. Short-term effects, while mitigated by careful consideration of routes and implementing design criteria, would be obvious to visitors as being more than typical trail maintenance. In the long term, the potential for unauthorized use into the roadless expanse is highest under this alternative due to the additional widening needed for machinery on trail #348 and off-trail where equipment trails, prescribed fire lines and fuel reduction treatments would create openings that may become susceptible to unauthorized motorized use. However, design criteria would include rehabilitation efforts immediately following treatments, which include returning disturbed areas to their natural contour, scarification, seeding with native mix and installing natural barriers. Disturbed areas would be monitored over time and additional barriers installed if a pattern of unauthorized use begins (see the Tenmile – South Helena Recreation report for further details). With the successful completion of design criteria, the likelihood of unauthorized motorized use occurring would be minimal and therefore would have a negligible effect on the roadless expanse.

Other short-term indirect impacts on the undeveloped attribute include smells of smoke, which could persist for a few days after ignition. However, it is not expected for smoke emissions to exceed state of Montana air quality standards and there would likely be less smoke than what is predicted under the no action alternative. See the Tenmile – South Helena Air Quality Specialist report for further information on impacts due to smoke emissions. Dust from machinery could also be present while operations were occurring. These effects would not cause lasting impacts on the undeveloped attribute.

Outstanding opportunities for solitude or primitive unconfined recreation – *Solitude is a personal, subjective value defined as the isolation from sights, sounds, and presence of others and from developments and evidence of humans. Primitive recreation is characterized by meeting nature on its own terms, without comfort and convenience of facilities.*

This alternative has the most potential short-term direct effect to solitude. Impacts would occur during project implementation due to the presence of Forest personnel managing the prescribed fire and noise associated with the use of chainsaws for the hand slashing of generally small diameter trees. Helicopters and other machinery associated with prescribed fire operations and harvest treatments would impact solitude in the short-term.

Due to road use (Road 1864) in the Jericho Mountain roadless expanse and its long, narrow shape, opportunities for solitude are moderate. However, the opportunity for solitude would improve post implementation due to the decommissioning of road 1864 proposed under both action alternatives. Additionally, in the short-term, it could be difficult for visitors to escape sights and sound of others while the project activities are occurring. Opportunities for solitude would be higher in the Lazyman Gulch roadless

expanse; however, solitude could be compromised near area roads. In some of the units proposed for burning, there would be a greater sight distance than at present and for several years visitors could become more aware of other activities in the area as well as on private lands. This effect would not be as great as potential effects from a large wildfire. The greatest impacts to solitude would be near the private lands, especially in Lazyman Gulch roadless expanse where inholding exist and private adjacent to its northern boundary.

Effects to primitive and unconfined recreation would be minor and limited to those time periods when activities were taking place. People could be displaced from favorite areas while project implementation was occurring, particularly in the Jericho Mountain roadless expanse where a larger portion of the area is proposed for treatments. An indirect effect of proposed prescribed fire activities could be displacement of visitors to untreated areas for recreation, mostly because of visuals. Downfall from burned trees could dissuade some visitors. This effect could last several years in the units proposed for mixed severity fire. However, only 1,100 acres of the Jericho Mountain roadless expanse are proposed for this type of treatment and 612 in Lazyman Gulch roadless expanse; these represent a small portion of the entire roadless expanse.

Special Features

There are no existing special (sensitive) soils or other known special features in the roadless expanse. There are existing identified historical/cultural sites and historic mining districts within the roadless expanse. These would be protected by mitigation measures during treatment actions.

Manageability

The action alternatives would have no perceivable impact on the existing manageability value of the roadless expanse in the analysis area. There are no new permanent or temporary roads proposed in the roadless expanse that would complicate potential wilderness boundary management. Wilderness boundary management would also potentially improve because of road decommissioning in the roadless expanse areas.

Alternative 3

Direct and Indirect Effects

Effects to wilderness attributes would be similar to alternative 2; however, the level of effects would be less due to the reduced acreages proposed for treatment and for the elimination of mechanical treatment except in private land buffers. In the Lazyman Gulch roadless expanse, more low-severity fire would occur and more work in the buffer areas than under alternative 2.

Only 17 percent of the Jericho Mountain roadless expanse and 30 percent of the Lazyman Gulch roadless expanse would fall under some type of treatment under this alternative. The remainder of the roadless expanse would not be treated. The risk of uncharacteristic wildfire³ would be reduced in those areas because the ability for fire to spread across the landscape would be hampered due to adjacent areas where treatments are proposed (see the Tenmile – South Helena Fire and Fuels report). This being said, there would still be

an effects to naturalness in the untreated areas similar to alternative 1 but at a lesser extent.

Natural – *The extent to which long-term ecological processes are intact and operating*

Effects would be similar to alternative 2 in the small portions of the roadless expanse where treatments would occur. There would be much less treatment particularly in the Jericho Mountain roadless expanse (17 percent in alternative 3 versus 47 percent in alternative 2), and consequently less impact to naturalness from human manipulation of the environment. However, unnatural conditions would continue to prevail over much of the roadless expanse due to lack of intervention. The effects of the MBP epidemic would continue in a large portion of the area along with associated impacts to the natural ecosystem. The potential of negative post-wildfire impacts would be more likely than in alternative 2, but less than in alternative 1.

Undeveloped – *The degree to which development and uses are apparent to most visitors*

Impacts from management treatments would be similar to alternative 2, although the acreage is considerably less under this alternative. For example, the acres proposed for mixed severity prescribed fire are only half in Lazyman Gulch roadless expanse as proposed in alternative 2. While there would be fewer acres, however, the total prescribed fire control line mileage could be more since the units are less contiguous in this alternative.

There would be a negligible effect from mechanized equipment under this alternative because mechanized equipment would occur only within the private land buffer treatments. The potential for user-created routes from mechanized access would mostly be eliminated in all treatment types located in the roadless expanse. Visitors could still attempt to drive on prescribed fire control lines, but the potential is much less than under alternative 2. Although sight and sounds from mechanical equipment would not be present in the roadless expanse (excluding private land buffers), implementation of prescribed fire treatments would still utilize chainsaws, helicopters and forest workers.

Outstanding opportunities for solitude or primitive unconfined recreation – *Solitude is a personal, subjective value defined as the isolation from sights, sounds, and presence of others and from developments and evidence of humans. Primitive recreation is characterized by meeting nature on its own terms, without comfort and convenience of facilities.*

This alternative would have less effect to this attribute than under alternative 2, but more than in alternative 1. Though more limited in scope, forest workers would be present in portions of the roadless expanse for the amount of time it takes to complete treatments. Solitude could be difficult to find during periods of prescribed burning and hand treatments depending on length of treatment, amount of personnel and preparation time. However, less than a quarter of the Jericho Mountain roadless expanse and less than half of the Lazyman roadless expanse would be treated. Visitors to those untreated areas could still be exposed to the sights and sounds of activities depending on the distance they are located from them. However, for most of the area, existing conditions for these attributes would remain unchanged.

The special features and manageability attributes as well as irretrievable and irreversible commitments are the same as discussed in alternative 2 above.

Forest Plan Consistency

The actions proposed by alternatives 2 and 3 are consistent with Forest Plan direction for goals and standards prescribed for management areas located within the roadless expanse. The impacts of the proposed activities on the roadless resource would remain within Forest Plan standards. The no action alternative is minimally consistent with Forest Plan direction; over time the goals for forage and healthy timber stands could become compromised without attention to the MBP effected trees and associated risk of potential negative impacts from wildfire.

All alternatives comply with the Roadless Area Conservation Rule and applicable Forest Plan standards as amended by this rule.

Cumulative Effects Common to Both Action Alternatives

Cumulative effects would be similar for both action alternatives. The differences lie in the number of acres treated: 7,936 in alternative 2 and 4,902 in alternative 3; 47 percent (Jericho Mountain) and 34 percent (Lazyman Gulch) of the roadless expanse affected in alternative 2 versus 17 percent and 30 percent in alternative 3. When other proposed projects are considered, including the Telegraph Vegetation project, which occurs in 11 percent of the Jericho Mountain roadless expanse, the Jericho Mountain area would potentially be the most affected cumulatively. However, when combined with past and proposed actions, less than half of the roadless expanse will have been subject to human manipulation. The naturalness of the area in the long term would be improved.

The long-term impacts of other ongoing and reasonably foreseeable activities, such as noxious weed treatment and vegetation projects, when added to the activities proposed in the Tenmile-South Helena Project, have the potential to cumulatively impact the natural and undeveloped characteristics by causing changes to the scenic qualities within the project area and creating a setting where resource modifications and utilization practices are evident. Most of these effects would ultimately be beneficial because they would increase the resiliency of forest conditions and reduce the risk of potential negative impacts from wildfire, therefore maintaining the roadless and wilderness qualities that are currently valued by the public. Most effects would be short term and experienced during the project implementation phase.

Other present and reasonably foreseeable future activities include continued maintenance on open forest roads, including maintaining road and surface drainage to address current resource issues such as erosion, clearing roadside vegetation, and repairing and maintaining culverts. These activities will have a largely neutral effect on potential wilderness attributes in the analysis area, as they will perpetuate the existing human-modified landscape condition.

Irreversible and Irretrievable Commitments Common to Both Action Alternatives

There would be no irreversible or irretrievable commitments to roadless resources with either action alternative. The likelihood of wildfire and the associated impacts would be reduced in the treated areas, lowering the risk of an irretrievable effect.

Conclusions

Under the no action alternative, potential impacts to natural and recreation values would result from not addressing the MPB outbreak and the associated fallen trees and increased risk of uncharacteristic wildfire that a lack of treatment would produce. Potential impacts of uncharacteristic, high-severity fires could include health and safety risks to public as well as to forest workers and fire suppression crews as well as impacts to the municipal watershed. The purpose and need of the Tenmile-South Helena Project would not be met.

Alternative 2, the proposed action, would have short-term direct impacts to roadless resources during project implementation such as increased presence of people and noise within the project area. The proposed treatments would address the purpose and need for the Tenmile-South Helena Project, resulting in a more diverse, resilient and sustainable forest ecosystem with a reduction in risk of negative impacts from wildfire. The long-term indirect effects from alternative 2 to roadless resources would be generally beneficial and help to maintain the existing recreation settings and scenic qualities within the project area. Potential long-term impacts to roadless expanse resources could occur if egress/ingress access for machinery provides opportunities for unauthorized motorized access by the public however, mitigation measures such as barriers would be installed following implementation that would reduce the likelihood of unauthorized access. Decommissioning of 8 miles of road would enhance opportunities for solitude in the roadless expanse.

Impacts would be stable or improving for a majority of roadless area characteristics and wilderness attributes with short-term impacts to the undeveloped character from the hand slashing of generally small diameter trees and construction of prescribed fire control lines, short-term impacts to solitude during project implementation.

Cumulative effects to roadless resources from both alternative 2 and 3 would generally be short term and related to an increased presence of people, vehicles and the associated noise that may affect solitude.

The effects of alternative 3 relative to roadless resources would be similar to those described for alternative 2, but the impacts would occur on fewer acres and with less potential impact for unauthorized road creation by recreational users. Duration of impacts would be short-term (up to 5 years).

Long-term, the action alternatives would have a neutral to positive impact on roadless values by improving some components of the natural and undeveloped attributes, such as improved functioning of the natural ecosystem.

Transportation

Introduction

The purposes of the Tennile-South Helena Project are to improve conditions for public and firefighter safety across the landscape in the event of a wildfire and to maintain consistent quantity and quality of water within the municipal watershed. This report summarizes the analysis and effects to the transportation resources within the project area boundary, as well as access corridors that provide connections to Montana Highway 12, Interstate 15, and the City of Helena.

The measurement indicators for this resource are: miles of road that would be used as haul roads, miles of road reconstruction, miles of road maintenance, miles of new temporary road construction, miles of road decommissioned, and a summary of stream crossing improvements.

Under alternative 1, roads would continue to provide access for forest users and private property. Alternative 1 is consistent with the Forest Plan because it meets the Forest-wide road management standards as shown in the DEIS Appendix B: Forest Plan Consistency Tables.

Alternative 2 proposes vegetative treatments for 24,308 acres. To access treatment units with fuel removal, approximately 32 miles of road would be reconstructed, 6 miles of road would be maintained, and approximately 43 total miles of temporary road would be built (39 miles by FS, 4 miles by BLM). Temporary roads would be closed and rehabilitated following the project. Several stream crossings would be replaced with pipes sized to pass at least the 25-year (4 percent occurrence probability) flood event (see the project's Hydrology report for more information regarding stream crossing improvements). Compliance with the Forest-wide road and road management standards would ensure that alternative 2 is consistent with the Forest Plan as shown in DEIS DEIS Appendix B: Forest Plan Consistency Tables.

Alternative 3 proposes vegetative treatments for 18,112 acres. To access treatment units with fuel removal, approximately 28 miles of road would be reconstructed, 4 miles of road would be maintained, and approximately 24 total miles of temporary road would be built (21 miles by FS, 3 miles by BLM). Temporary roads would be closed and rehabilitated following the project. Several stream crossings would be replaced with pipes sized to pass at least the 25-year (4 percent occurrence probability) flood event (see the project's Hydrology report for more information regarding stream crossing improvements). Compliance with the Forest-wide road and road management standards would ensure that alternative 3 is consistent with the Forest Plan as shown in DEIS Appendix B: Forest Plan Consistency Tables.

Assumptions

Detailed road condition surveys have not been conducted, so identified work associated with using roads for haul is based on general site reconnaissance and local knowledge of the area by forest engineers.

The road network is analyzed beginning at Montana Highway 12, Interstate 15, and the City of Helena.

Information Used

The available forest transportation atlas, including spatial GIS and tabular Infra infrastructure data, has been used for summarization and analysis of the transportation system. Unauthorized routes not included in the forest transportation atlas are not considered in the following analysis. For a discussion on these routes, refer to the Tenmile-South Helena Hydrology specialist report.

A roads sediment survey was performed for the project analysis. Roads within the area were surveyed in detail; sites where sediment was being transported to stream channels were evaluated and located with GPS (Global Positioning System) units. Parameters measured at the sites were those required by the Water Erosion Prediction Project (WEPP): Road model. Data included road design, dimensions, gradient, surface material, buffer dimensions, and overall disturbance width and length. The survey focused on Forest Service-owned roads in the watersheds. Not all Forest Service roads were surveyed.

A culvert survey was completed for the project analysis. Culverts within the area were surveyed in detail by Forest Service personnel, in accordance with the guidelines contained in the National Inventory and Assessment Procedure-For Identifying Barriers to Aquatic Organism Passage at Road-Stream Crossings (Clarkin et al. 2005).

A field review of roads was conducted by a transportation specialist in October 2014, during which field notes and photographs were gathered. This information, in addition to local knowledge of other roads on the transportation system, was used to categorize necessary work (reconstruction or maintenance) on existing haul routes.

Methodology

The transportation system was analyzed using transportation data from the sources listed above. This data was used to evaluate the effects of each alternative (alternatives 1, 2, and 3). The alternatives and their effects were analyzed on the basis of: miles of road that would be maintained or reconstructed, miles of roads used as haul roads, miles of new temporary road construction, miles of road decommissioned, and a summary of stream crossing improvements. These mileage calculations were completed using the forest transportation atlas, including linked available GIS spatial and Infra tabular data.

Transportation, Affected Environment

Introduction

This section describes the transportation system within the project area. Information included in this section is from a 2014 transportation specialist field visit, as well as local knowledge from utilization of roads in the project area. The measurement indicators for this resource are: miles of road that would be used as haul roads, miles of road reconstruction, miles of road maintenance, miles of new temporary road construction, miles of road decommissioned, and a summary of stream crossing improvements.

Analysis Area

The forest transportation system is a site-specific feature on the land and effects to this resource are localized. As a result, the project area is used as the geographic boundary for direct, indirect and cumulative effects to the transportation resource. In addition, haul roads that extend outside the project boundary are included in the analysis. Figure 118 shows the existing forest transportation system within the project area.

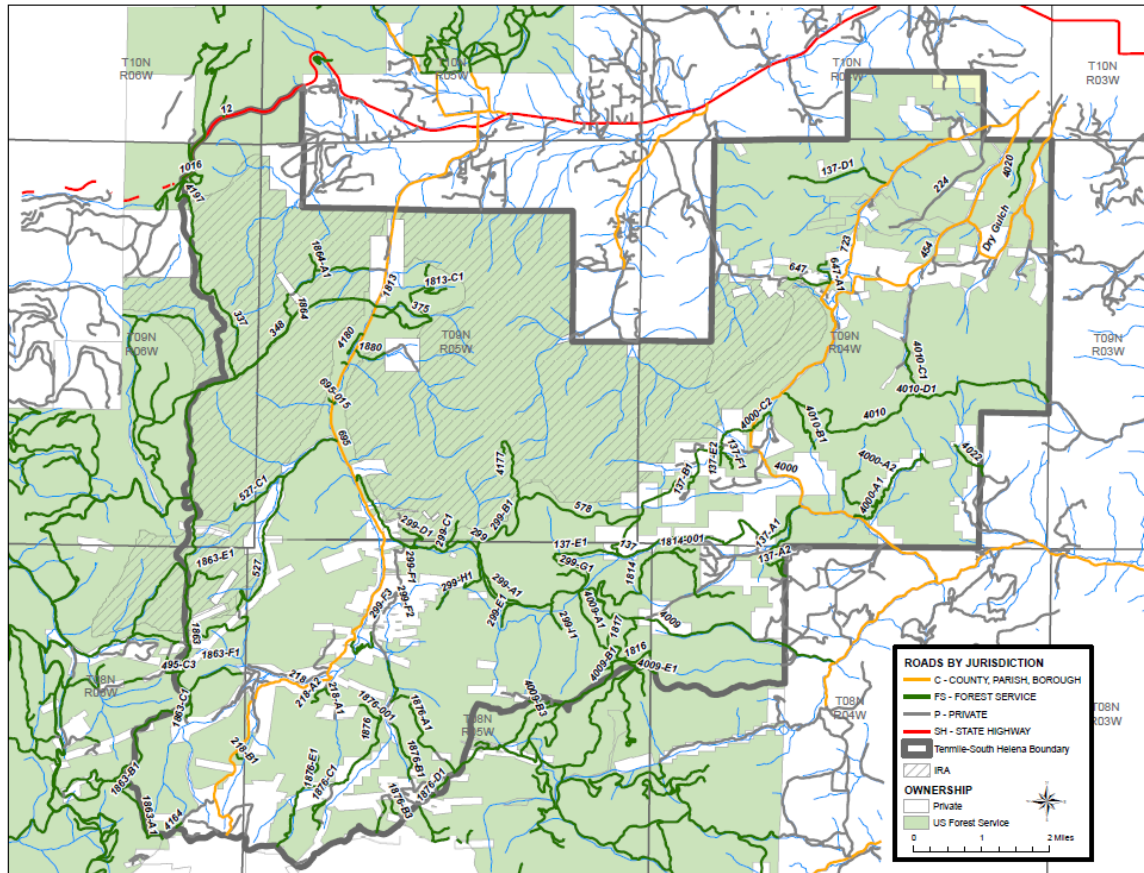


Figure 118. Existing roads in the Tenmile-South Helena project area

Existing Forest Transportation System

Forest Service

An extensive road network exists within the project area to support community access and management activities of the National Forest System (NFS) lands, including mining and timber management, fuels treatment and recreation. Approximately 172.03 miles of existing road are located within the boundary of the Tenmile-South Helena project area. Most of these roads are under the jurisdiction of Forest Service (95.77 miles), while others fall under private (44.75 miles), state (2.50 miles) or county (29.01 miles) jurisdiction. A majority of roads under Forest Service jurisdiction (85.12 miles) are managed as National Forest System roads. A summary of National Forest System (NFS) roads within the project area is provided in Table 238.

Table 238. National forest System Roads within the project area.

Operational Maintenance Level	Miles
5 – High Degree of User Comfort	0.03
4 – Moderate Degree of User Comfort	4.66
3 – Suitable for Passenger Cars	15.23
2 – High Clearance Vehicles	19.84
1 – Basic Custodial Care (Closed)	45.36

An additional 12.24 miles of road are outside the project area yet provide access to the area from US-12, I-15, and the City of Helena. These roads are included in the analysis when associated with the action alternatives to facilitate access to the project area for the purpose of fuel removal. The majority of these roads are county jurisdiction, and the remainders are NFS or private roads.

Table 239. Tenmile-South Helena project access road summary by jurisdiction

Road Mileage	Jurisdiction
0.85	Private
10.56	County (Lewis & Clark, Jefferson)
0.83	Forest Service

Forest Road 695 (Rimini Road) serves as the primary access route to the western portion of the project area. This road begins at Montana Highway 12 and accesses the town of Rimini. South of Rimini, this road turns into Forest Road 218 (Tenmile Road) and continues on to function as a collector road for the west portion of the Tenmile-South Helena project units. Both Rimini and Tenmile roads are under Lewis and Clark County jurisdiction.

Forest Roads 723 (Grizzly Gulch), 454 (Unionville), 4000 (Travis Creek), and 426 (Lump Gulch) connect to create a loop that provides primary access to the north-eastern and north-central portion of the project area. The loop begins at the outskirts of the City of Helena, and connects to Interstate 15 near the town of Clancy. Grizzly Gulch and Unionville roads are under Lewis and Clark County jurisdiction, and Travis Creek and Lump Gulch are under Jefferson County jurisdiction. Forest Road 4009 (Park Lake Road) intersects FR 426 and provides access to the south-eastern portion of the project area. This road is surfaced with crushed rock, and is Forest Service jurisdiction.

The majority of additional roads providing access to the project area units are lower standard NFS roads. There are several segments of road under private jurisdiction, associated with private inholdings.

Forest Roads and National Forest System roads have received past maintenance as time and funding allowed. Past timber management has provided for road improvements and maintenance to support timber product removal. In addition, work has been done to support mining reclamation activities, such as the Upper Tenmile Creek EPA Superfund project.

There are approximately 11.32 miles of existing roads located within the Jericho Mountain and Lazyman Gulch Inventoried Roadless Areas (IRA). Most of these roads are under the jurisdiction of Forest Service. A majority of roads under Forest Service jurisdiction are managed as National Forest System roads. See the Tennmile – South Helena Roadless report for additional information regarding roads in roadless.

Bureau of Land Management

Treatment for BLM units on the north-eastern side of the project is limited to prescribed fire. There is no proposed product removal, so analysis for timber haul is not carried forward.

Forest Road 696 (Colorado Gulch) provides access to BLM treatment units in the north-central project area, and is under Lewis and Clark County Jurisdiction. This road begins at Montana Highway 12 and functions as a collector road for segments of road, primarily private, that provide access to individual units. These roads would require coordination with the appropriate landowner or agency to acquire appropriate access and use agreements prior to implementation. None of these roads are National Forest System roads, so analysis for timber haul is not carried forward.

Transportation, Environmental Consequences

Effects Common to All Alternatives

The Forest would continue to apply recurrent road maintenance for higher standard National Forest System roads within the analysis area as funding allows. Other routes in the area, not on the Forest Transportation System, would be maintained by the applicable jurisdiction.

Effects Common to Both Action Alternatives

Truck traffic would increase during project implementation, which would have an effect on public usage. Truck traffic effects would include temporary delays on the road and temporary road closures. The increase in heavy truck traffic on roads would have an effect on use of the area by the public while heavy truck traffic is present due to short delays. Further effects are discussed in the Tennmile-South Helena Recreation specialist report.

Wetland restoration would be performed along Forest Road 299, which would include filling approximately 1,700 feet of drainage ditch to restore water level to a 25 acre wetland, in addition to approximately 400 feet of road reconstruction to provide better drainage control through the road. Additionally, about 2,000 feet of Forest Road 299 would be relocated out of wetland areas to drier, lower-gradient side slopes.

Approximately 15 miles of National Forest System road identified as decommissioning candidates in the Divide Travel Plan Draft Decision would be decommissioned. Refer to the Hydrology specialist report for further discussion on these roads.

Increases in sedimentation caused by erosion and dust on haul routes would be short term, and maintenance and improvements to the road system would provide long-term

benefits to the transportation system (see Tenmile-South Helena Hydrology specialist report).

Haul roads for product removal from proposed vegetation units are identified for the action alternatives. Where applicable, necessary road work for each haul road within the National Forest System is identified, and categorized as maintenance or reconstruction.

Road maintenance would be used to keep the road at an acceptable level that meets BMP standards and allows for safe timber haul. Typical road maintenance activities would include surface blading, vegetation removal, minor slump repair, and drainage structure cleaning and/or installation. Road maintenance would occur prior to, during, or after haul. Assigned objective maintenance levels of National Forest System roads would not change as a result of the Tenmile-South Helena project.

Road reconstruction would be used to bring the road up to an acceptable level, in order to meet BMP standards and allow for safe timber haul. In addition to basic maintenance activities (listed above), reconstruction would also involve more significant roadway improvements, realignment, curve widening, or subgrade boulder or cobble excavation and removal. Reconstruction would occur prior to haul.

Site-specific tasks for each haul road would be determined during implementation, within the general scope of activities identified above.

In addition to existing roads, temporary roads are also proposed for each action alternative. These roads would be improved or constructed to a minimal standard in order to provide access for harvesting equipment and log trucks. These roads are improved to a minimal standard for short-term project use, and then closed and rehabilitated following use. Tenmile-South Helena Project temporary roads would be decommissioned by obliteration, including: recontouring (returning the prism to natural contour), replacing topsoil, placing woody debris upon the disturbed area to provide stability, and seeding the disturbed area.

Alternative 1 – No Action

If alternative 1 is chosen no vegetation treatments would occur, no road improvements would be made and no new roads would be constructed.

Direct and Indirect Effects

Under the no action alternative, no changes would be made to the existing transportation network on and adjacent to the project area. Temporary road construction would not occur. Roads would continue to receive use for utilization and administration of NFS lands and access to various locations on the Forest, as well as private property. Higher standard roads such as FS Road 4009 would continue to receive annual maintenance as time and funding allows. However, roads would not be improved to accommodate safe use of haul vehicles at this time.

Road management would not change as part of the no action alternative. Ongoing closures would remain the same and no new road closures would be implemented.

Irreversible and Irretrievable Commitments

There are no irreversible and irretrievable commitments associated with this alternative.

Cumulative Effects

Cumulative effects are the effects of past activities added with the effects of proposed actions. Since there are no activities proposed under alternative 1, there are no cumulative effects related to alternative 1. Present, ongoing, and foreseeable activities would continue to affect road conditions.

Alternative 2 – Proposed Action

Approximately 24,308 acres of vegetation treatments are proposed under alternative 2. Of these, units proposed for ground-based or cable logging would require the use of haul routes to facilitate access to units for the purpose of removing fuel concentrations.

Direct and Indirect Effects

Haul Roads

There are approximately 139 miles of haul roads identified for implementing vegetation treatments proposed in alternative 2. Figure 119 shows location of the haul roads and proposed work on NFS roads for Alternative 2. Of the NFS routes, 6 miles are identified for maintenance, and another 32 miles are identified for reconstruction. Another 39 miles of temporary roads (to be followed by full obliteration post-implementation) are also proposed under this alternative, with the BLM proposing an additional 4 miles of temporary road construction.

Approximately 59 miles identified for use as haul roads are not under Forest Service jurisdiction. These roads would require coordination with the appropriate landowner or agency to acquire appropriate access and use agreements prior to implementation.

Table 240. Haul road jurisdiction – alternative 2

Jurisdiction	Miles
Forest Service	38.0
County	43.8
Private	14.8
Temporary Road – Forest Service	39
Temporary Road - BLM	4
HAUL ROAD TOTAL	139.6

Forest Road 1863-E1 (.76 miles) and a segment of 1863 (.74 miles) are identified for use as haul roads within the Jericho Mountain Inventoried Roadless Area (IRA). These segments would be maintained in accordance with their existing assigned maintenance level to continue to meet BMP standards and allow for safe timber haul. No temporary road construction or road reconstruction would occur in any IRAs under this alternative.

Table 241. Haul road work summary in IRA – alternative 2

Type of Work	Miles
Continued Maintenance	1.5
Reconstruction	0
HAUL ROAD in IRA TOTAL	1.5

Wetland restoration would be performed along Forest Road 299, which would include filling approximately 1,700 feet of drainage ditch to restore water level to a 25 acre wetland, in addition to approximately 400 feet of road reconstruction to provide better drainage control through the road. Additionally, roughly 2,000 feet of Forest Road 299 would be relocated out of wetland areas to drier, lower-gradient side slopes.

Roadside hazard trees would be removed as necessary to provide for safe timber haul (approximately 1½ tree lengths from the roadway).

Stream crossing structures, including bridges with posted load-restrictions, would be evaluated by the Forest Engineer prior to hauling 40-ton loads across. Necessary mitigation measures would be in place prior to overloading.

Stream Crossing Improvements

To improve watershed conditions, reduce sedimentation, increase sizing to accommodate 25-year flow events, and/or provide for aquatic organism passage, a number of road stream crossings would be improved in the project area. See Tenmile-South Helena Hydrology and Fisheries specialist reports for specific locations and mitigations.

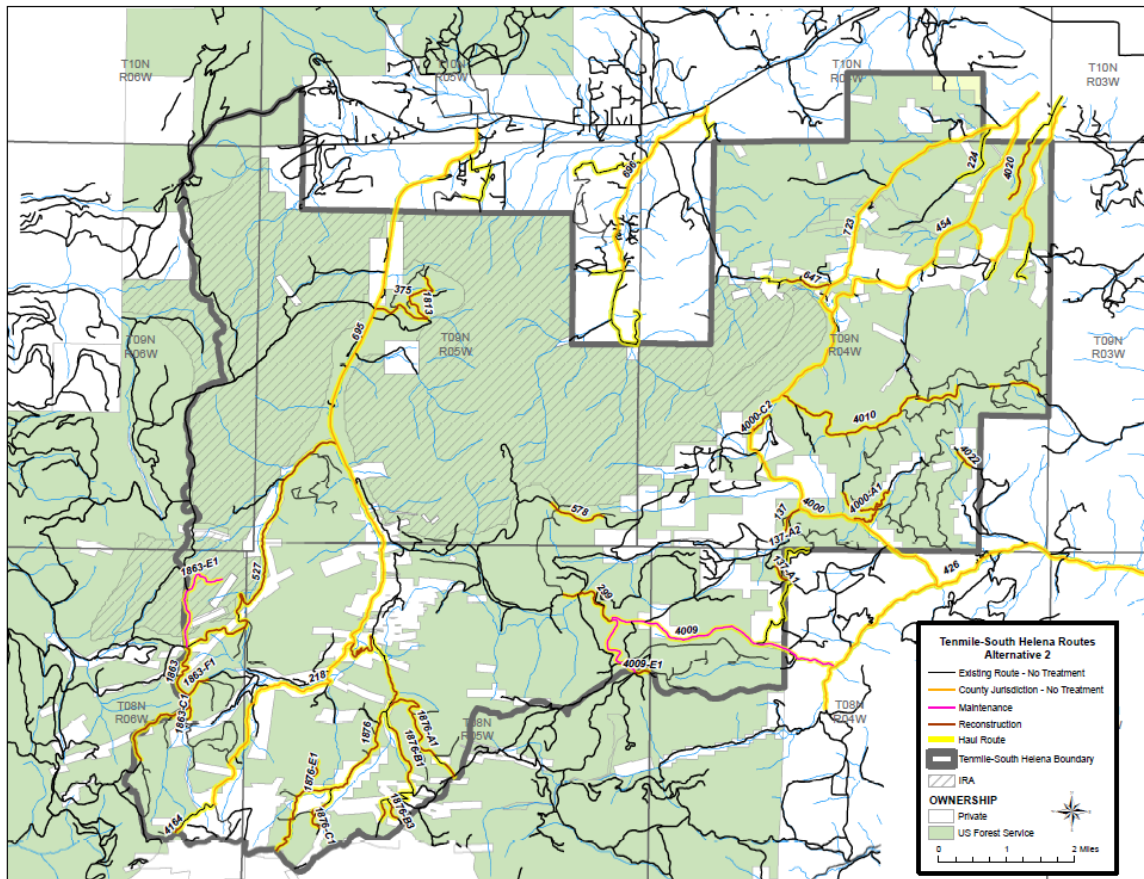


Figure 119. Haul roads and proposed road work, alternative 2

Irreversible and Irretrievable Commitments

There are no irreversible and irretrievable commitments associated with this alternative.

Cumulative Effects

Under alternative 2, maintenance and improvements to the road system occurring as part of the Tennile-South Helena Project, when coupled with reasonably foreseeable road maintenance and improvement activities, would result in long-term beneficial cumulative effects such as reduced road surface erosion, improved functionality of the roads, and extended road life. Roads would also be safer for use, since roadside hazard trees would be mitigated. Approximately 15 miles of National Forest System road identified as decommissioning candidates in the Divide Travel Plan Draft Decision would be decommissioned, but travel management would not change as part of this alternative. Ongoing closures would remain the same and no new road closures would be implemented that were not included in the Divide Travel Plan.

Alternative 3

Alternative 3 was developed based on internal and external resource issues that were identified through scoping. Comments about potential treatment effects on Inventoried Roadless Areas, wildlife, and recreationist values drove the development of this alternative.

Approximately 18,112 acres of vegetation treatments are proposed under alternative 3. Of these, units proposed for ground-based or cable logging would require the use of haul routes to facilitate access to units for the purpose of removing fuel concentrations.

Direct and Indirect Effects

Haul Roads

Effects of alternative 3 would be similar to alternative 2, however with slightly fewer miles of road use. Under alternative 3, approximately 108 miles of haul roads would be used to access vegetation treatment units and remove fuel in haul vehicles. Figure 119 shows location of the haul roads and proposed work on NFS roads for alternative 2. Of the NFS routes, 4 miles are identified for maintenance, and another 28 miles are identified for reconstruction. Approximately 21 miles of temporary roads (to be followed by full obliteration post-implementation) are also proposed under this alternative, with an additional 3 miles proposed by the BLM.

Approximately 53 miles identified for use as haul roads are not under Forest Service jurisdiction. These roads would require coordination with the appropriate landowner or agency to acquire appropriate access and use agreements prior to implementation.

Table 242. Haul road jurisdiction – alternative 3

Jurisdiction	Miles
Forest Service	32.0
County	43.5
Private	9.1
Temporary Road – Forest Service	21.0
Temporary Road - BLM	3.0
HAUL ROAD TOTAL	108.6108.6

Wetland restoration would be performed along Forest Road 299, which would include filling approximately 1,700 feet of drainage ditch to restore water level to a 25 acre wetland, in addition to approximately 400 feet of road reconstruction to provide better drainage control through the road. Additionally, about 2,000 feet of Forest Road 299 would be relocated out of wetland areas to drier, lower-gradient side slopes.

Roadside hazard trees would be mitigated as necessary to provide for safe timber haul (approximately 1½ tree lengths from the roadway).

Stream crossing structures, including bridges with posted load-restrictions, would be evaluated by the Forest Engineer prior to hauling 40-ton loads across. Necessary mitigation measures would be in place prior to overloading.

Stream Crossing Improvements

To improve watershed conditions, reduce sedimentation, increase sizing to accommodate 100-year flow events, and/or provide for aquatic organism passage, a number of road stream crossings would be improved in the project area. See Tenmile-South Helena Hydrology and Fisheries specialist reports for specific locations and mitigations.

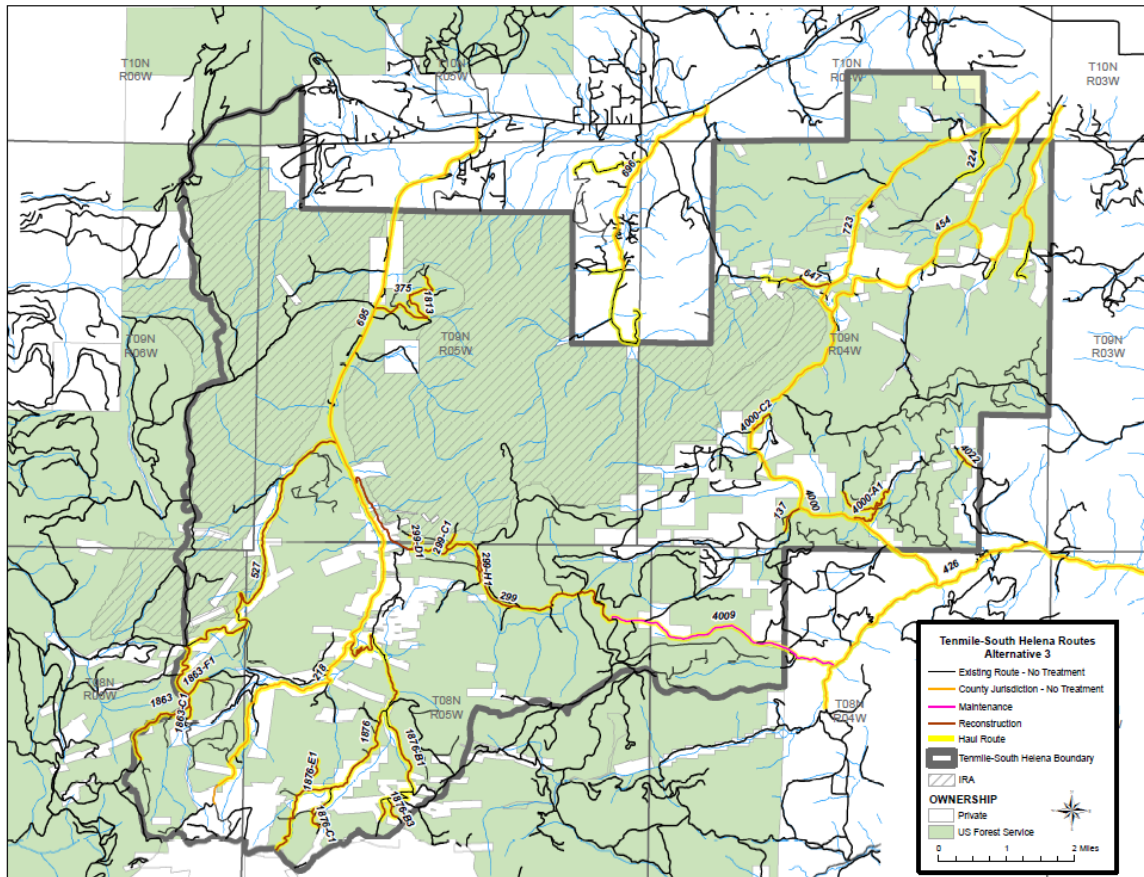


Figure 120. Haul roads and proposed road work, alternative 3

Irreversible and Irretrievable Commitments

There are no irreversible and irretrievable commitments associated with this alternative.

Cumulative Effects

Under alternative 3, maintenance and improvements to the road system occurring as part of the Tennile-South Helena Project, when coupled with reasonably foreseeable road maintenance and improvement activities, would result in long-term beneficial cumulative effects such as reduced road surface erosion, improved functionality of the roads, and extended road life. Roads would also be safer for use, since roadside hazard trees would be mitigated. Approximately 15 miles of National Forest System road identified as decommissioning candidates in the Divide Travel Plan Draft Decision would be decommissioned, but travel management would not change as part of this alternative. Ongoing closures would remain the same and no new road closures would be implemented that were not included in the Divide Travel Plan.

Conclusions

A summary of the alternatives and the associated road network, maintenance, and road management is included in Table 243.

Table 243. Alternative summary table

Resource/Issue	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3
Haul Roads (miles)	0	139	108
Maintenance (miles) <i>NFS Roads</i>	0	6	4
Reconstruction (miles) <i>NFS Roads</i>	0	32	28
Temporary Road (miles) <i>Forest Service</i>	0	39	21
Temporary Road (miles) <i>BLM</i>	0	4	3
Road Relocation: Reconstruction (miles)	0	0.45	0.45
Decommissioning (miles)	0	15	15

Under alternative 1, roads would continue to provide access for forest users and private property. Alternative 1 is consistent with the Forest Plan because it meets the Forest-wide road management standards as shown in DEIS Appendix B.

Alternative 2 proposes vegetative treatments for 24,308 acres. To access treatment units with product removal, approximately 32 miles of road would be reconstructed, 6 miles of road would be maintained, and approximately 43 total miles of temporary road would be built (39 miles by FS, 4 miles by BLM). Temporary roads would be closed and rehabilitated following implementation. Several stream crossing structures would be improved. Compliance with the Forest-wide road and road management standards would ensure that alternative 2 is consistent with the Forest Plan as shown in DEIS Appendix B.

Alternative 3 proposes vegetative treatments for 18,112 acres. To access treatment units with product removal, approximately 28 miles of road would be reconstructed, 4 miles of road would be maintained, and approximately 24 total miles of temporary road would be built (21 miles by FS, 3 miles by BLM). Temporary roads would be closed and rehabilitated following implementation. Several stream crossing structures would be improved. Compliance with the Forest-wide road and road management standards would ensure that Alternative 3 is consistent with the Forest Plan as shown in DEIS Appendix B.

Heritage

Introduction

The term “cultural resource” refers to an object or definite location of human activity, occupation, or use identifiable through field survey, historical documentation, or oral evidence (Forest Service Manual 2360). Cultural resources are prehistoric, historic,

archaeological, or architectural sites, structures, places, or objects and traditional cultural properties (FSM 2360). In this section, cultural resources include the entire spectrum of resources for which the Heritage Program is responsible for from artifacts to cultural landscapes without regard to eligibility for listing in the National Register of Historic Places (FSM 2360).

In this section, the cultural and historic context of the Tennmile-South Helena project area is examined and cultural resources in the plan area are identified. Existing information is used to assess the condition of these resources, including historic resources in the plan area identified as eligible or listed in the National Register of Historic Places and designated traditional cultural properties. Trends that affect these resources are also assessed.

Like much of the HLCNF, the project area was extensively prospected and mined from the 1860s to the 1940s. The area of potential effect (APE) is covered with scattered prospect pits and trenches, ditches, adits, and related industrial features. In some cases, the treatments proposed for the Tennmile-South Helena project would have minimal adverse effect and require minimal or no mitigation work. For example, running prescribed fire atop scattered prospect pits (dirt piles) or water ditches, and hand-treating fuels in the area, would not cause an adverse effect. However, some proposed treatments do have the potential to cause adverse effects, but past experience has shown that with agreed upon resource protection measures the effects to cultural resources can be avoided, minimized or mitigated.

This specialist report serves as a diagnostic step; that is, the results from this report dictate what actions will be taken regarding cultural resources. The results will serve as the starting point for subsequent cultural resource management decision associated with this project.

Assumptions

The Heritage program assumes adequate time will be planned in the Tennmile-South Helena project time line to complete a good faith effort to identify historic properties, in accordance with 36 CFR 800.4(b)(1) prior to on the ground implementation of this project. A good faith effort can range from field investigation (sample and full coverage), background research, oral interviews and consultation to comply with Section 106 of the National Historic Preservation Act. To meet the current project timeline, the Heritage program is planning on phasing the scope and timing of their identification efforts to synchronize with the consideration of alternatives. Since we plan to defer completion of final identification of historic properties, we will assume the likely presence of historic properties for each alternative through background research, consultation, and the appropriate level of field identification, taking into account the number of alternatives, the magnitude of the undertaking and its likely effects, and the views of the SHPO/THPO and any other consulting party. It is currently assumed that GIS maps showing known cultural resource distribution, existing inventory (field survey) data, historic context review, and NHPA Section 106 consultation, provided an adequate means of assessing the general effects of the alternatives on cultural resources. Unquestionably, there are a hodgepodge of un-recorded cabins, structures, features and

artifacts associated with placer mining and early lode mining in the Tenmile-South Helena project area.

As currently planned it is anticipated that mitigation/resource protection measure can be designed to avoid adverse effects to historic properties, which would result in a No Adverse Effect finding on cultural resources. If it is determined that effect to a historic property(s) cannot be feasible or prudently avoided, the steps outlined in 36 CFR 800.4 through 800.7 will be followed.

Information Used

When a project is proposed on the Helena National Forest, Heritage program specialists participate in its planning and in the analysis of potential project effects. This participation consists of:

- 1) review of historical materials, archival documents, and overviews relevant to the project area;
- 2) analysis of the nature of the project and its potential to affect cultural resources;
- 3) review of public concerns regarding the project and its potential effect; and
- 4) consultation with interested Tribes, cultural resource interest groups and the Montana State Historic Preservation Office.

In the process, the Heritage Specialist determines the project's "area of potential effect" based on the geographic area in which a project may alter the character or use of any existing historic properties.

Based on this information, Heritage Specialists determine whether existing cultural resource data is adequate to complete the environmental analysis and disclose potential effects on cultural resources. If the information is insufficient, additional research and inventory is undertaken as needed. Where additional inventory is needed, Heritage personnel would design a survey strategy to locate all historic properties within the area of potential effect. This strategy is designed in accordance with the criteria defined in "Site Identification Strategy Prepared for the East Side Forest" (SIS). If a survey discovers previously unknown cultural resources, those resources are recorded and their National Register eligibility status determined in consultation with the Montana State Historic Preservation Office (MTSHPO). Both background research and fieldwork are documented in a Section 106 report submitted to the MTSHPO. The Heritage program manager consults with MTSHPO to determine the nature of the project's effects on significant properties. If needed, the Heritage program manager and MTSHPO work together to determine appropriate project redesign, restrictions, designation of sensitive areas or mitigation measures. The Heritage program manager coordinates recommendations, actions and monitoring with the project leader, MTSHPO and interested Tribal preservation officials.

A project is determined to affect a historic property when project activities alter the characteristics that qualify the property for inclusion in the National Register of Historic Places (NRHP). In determining the effect, alteration to features of the property's location, setting, or use may be relevant, depending on the property's significant

characteristics. An adverse effect results when the project may diminish the integrity of a historic property's location, design, setting, materials, workmanship, feeling, or association. According to the National Register Bulletin #15, adverse effects include (but are not limited to):

- physical destruction, damage, or alteration of all or part of the property
- isolation of the property from its setting; alteration of the setting's character when that character contributes to the property's National Register eligibility
- introduction of visual, audible, or atmospheric elements out of character with the property or its setting
- neglect of a property resulting in its deterioration or destruction

At this time cultural resource information is incomplete for the Tenmile-South Helena project area. To date, 72 heritage survey projects have been completed inside the general project area, totaling approximately 5,804 acres. Cultural Resource Management (CRM) is continuing to evolve with the public perception of cultural resources and for that reason it has been determined that inventories that occurred more than 10 years ago were done to different standards and should no longer be considered valid. When taking this into consideration approximately 4,203 acres need to be re-inventoried by either an intensive or sampling method. Approximately 1,601 acres of the project area has current cultural resource inventories, which leaves 84 percent of the project area un-inventoried.

Table 244. Cultural resource inventories within the project boundary

Year	Inventory Number	Inventory Name	Acres
1980	80-2-1	Squaw Gulch TS	47.72
1983	83-2-1	Squaw Gulch Rd. Relocation	18.91
1983	83-2-3	Strawberry TS	372.38
1987	87-2-3	Melick Small Tracts Parcel	43.31
1988	88-2-6	Pretty Girl Project	10.12
1988	88-2-9	Pangea EXP. INC. Land EX	74.79
1990	90-2-7	DOVI Claim	5.33
1995	95-2-19	Chessman Reservoir Dam	1.13
1995	95-2-30	Feathered Pipe Ranch STA	2.83
1996	96-2-08	Park Salvage Sale	38.04
1996	96-2-45	Mt. Helena Reconst.	33.38
1996	96-2-56	Moose Cr. Trailhead	3.59
1996	96-2-60	Stephens STA	1.91
1996	96-2-61	Martin STA	0.28
1996	96-2-62	Kelly STA	23.87
1996	96-2-63	Lovely STA	18.15
1996	96-2-64	Feathered Pipe STA	11.66
1996	96-2-71	Squaw gulch Rd. SUP	34.41
1997	97-2-15	Waterline Trail	10.79
1997	97-2-25	Eakin Special Use Permit	2.78
1997	97-2-27	Juisto STA	1.77

Year	Inventory Number	Inventory Name	Acres
1997	97-2-29	Nordell Land Exchange	26.31
1997	97-2-3	Clancy-Unionville Veg Project Phase I	1400.00
1997	97-2-30	Russell S.U. Road	7.17
1997	97-2-46	Minnihaha skid Trail	2.34
1997	97-2-48	Topolski SU Road	3.96
1998	98-2-31	Travis Water Development	23.78
1998	98-2-35	Whitman Water Dev.	3.15
1998	98-2-46	Prentice SUP Rd.	12.27
1998	98-2-58	Ten Mile Abandoned mine	11.76
1999	99-2-2	Clancy-Unionville Veg Project Phase II	541.00
1999	99-2-23	Mount Helena Ridge trail	2.92
1999	99-2-29	Anderson SUP Road	10.77
1999	99-2-31	Goodspeed SUP Road	1.39
1999	99-2-32	Haug SUP Road	21.44
1999	99-2-38	Reitema SUP Rd.	6.19
1999	99-2-42	Shannon Bell SUP Road	0.63
1999	99-2-47	Mike Lovely Land Exchange	109.92
2000	00-2-7	Old Georges Cabin	1.16
2001	01-2-17	Fee Demo & Developed Rec.	0.07
2001	01-2-22	Clancy-Unionville Veg. Project. Phase III	264.00
2002	02-2-03	Baxendale VFD Satellite Fire Station	2.14
2002	02-2-04	Davison STA	0.42
2002	02-2-08	Zucconi SUP Road	3.63
2002	02-2-09	EPA - Ten Mile Well Sites	16.89
2002	02-2-14	Black Meadows Water Dev.	0.23
2002	02-2-15	Homestead Spring Development	0.14
2002	02-2-16	Lucky Find Spring	0.36
2003	03-1-6	Jericho Mountain Trail Re-Route	21.56
2003	03-2-20	Tucker Dry Prescribed Burn	765.89
2003	03-2-30	South Hills Trail Construction	13.45
2004	04-1-10	Unionville Urban Interface Thinning Prj	5.60
2004	04-2-11	Tucker Dry Prescribed Burn - Phase 2	159.42
2004	04-2-29	Baxendale Fire Hall SUP	6.07
2005	05-1-7	Mac Pass ROW TS	10.50
2005	05-2-26	Moose Creek Thinning and toilet	27.34
2005	05-2-3	Mt. Helena Hazardous Fuels	509.74
2007	07-02-21	Springhill WUI Hazardous Fuels Reduction	5.45
2007	07-02-22	Blackhall Meadows Gully Erosion Remediation	0.26
2007	Project 4	MacDonald Pass Range Allotment Water Developments	0.23
2008	08-04-05	Minnehaha EPA Reclamation Staging Area	79.80
2009	09-02-09	South Helena Wildland-Urban Interface	33.26
2009	09-02-10	Brooklyn Bridge HMO	80.97

Year	Inventory Number	Inventory Name	Acres
2009	09-02-13	Travis Creek HMO Closure	13.29
2009	09-02-16	McKelvey Road Construction Project	7.34
2011	11-01-04	HMO Spraukel 01 HMO	0.60
2011	11-02-02	Rimini County Road Hazard Tree Removal	56.03
2011	11-02-13	Gayle Josin/Jim Posewitz SUP Haz Tree removal	9.88
2011	11-02-20	Wakina Sky Trail Relocation	38.14
2011	11-02-27	McKelvey Veg Project Phase I	216.18
2012	11-02-27	McKelvey Project Phase II	22.57
2013	R201301120003	Red Mountain Flume	490.00

Methodology

The key indicators for cultural resource analysis are generally: 1) the list of sites, by type, that are eligible for or included in the National Register of Historic Places, or those that have not been evaluated, which overlap with proposed activities; 2) the potential for the occurrence of cultural resources in areas that have not previously been surveyed; and 3) the nature of the proposed treatments. Undertakings involving ground disturbance or those that may adversely affect the character of significant cultural resources are primary considerations of the NEPA effects analysis. Sites that have been evaluated and found ‘not eligible’ (insignificant) according to criteria of 36CFR60.4 are reviewed for context, but not otherwise carried forward into the analysis.

The Regional PA and the Forest-specific SIS address details of NHPA/Sec. 106 compliance. They prescribe certain percentages of survey coverage for various types of undertakings, in order to adequately complete Sec. 106 effects analysis. The amount of survey and research anticipated depends on the undertakings involved. Information from this portion of the analysis assigns the ‘potential for the occurrence of cultural resources’ used in both NEPA and NHPA review.

Information from historic maps, the heritage resource database, and from numerous surveys done in the project area identifies specific locations of prehistoric and historic sites relative to proposed impact areas. This information provides historic context and helps identify both specific sites present and the kind of sites which may exist across the project area.

Evaluation of all potential historic properties, including traditional cultural properties follows a set of criteria established by the Montana SHPO and the National Park Service. Historic properties are determined to be significant if they meet one or more of the following criteria (USDI-NPS Bulletin 15):

- 1) They are associated with events that have made a significant contribution to the broad patterns in our history; and/or
- 2) They are associated with the lives of persons significant in our past;
- 3) They embody distinctive characteristics of a type, period, or method of construction that represents the work of a master, or that possess high artistic

values, or that represent a significant and distinguishable entity whose components may lack individual distinction;

- 4) They have yielded, or may likely yield, information important in prehistory or history.

If sites do not meet the criteria of eligibility for the National Register of Historic Places after consultation with the appropriate parties, Section 106 of NHPA stipulates no further consideration of cultural resources is necessary and the undertaking may proceed.

If a site meets any of these criteria, Section 106 requires an agency to determine the effect of the proposed action on the site. One of the following three determinations is possible:

- 1) No historic properties affected – a Heritage Specialist has determined that either there are no historic properties present or there are historic properties present, but the undertaking will have no effect upon them. The agency will notify all consulting parties and make the documentation available for public inspection before approving the undertaking.
- 2) Historic properties affected – a Heritage Specialist finds that there are historic properties the undertaking may affect or the SHPO/THPO or the Advisory Council objects to the agency's findings. The agency then will notify all consulting parties, invite their views on the effects, and assess adverse effects, if any.
- 3) Adverse effect – the Heritage Specialist determines that the effect on eligible cultural resources will be adverse. When an undertaking has been determined to have an adverse effect on a property eligible for listing, the agency is directed to consult with the SHPO/THPO and other consulting parties to develop and evaluate alternatives or modifications to the undertaking that could avoid, minimize or mitigate adverse effects on historic properties. Mitigation of a significant cultural resource entails a range of options including project redesign, and avoidance, documentation (photography and archival research), restoration and data recovery (through archaeological excavation). Mitigation options are selected on a case-by-case review and are tailored to the distinct values of the property and the planning options available within the project design. Once the agency and the SHPO agree on the mitigation measures for eligible properties affected by the undertaking and the conditions or stipulations have been met, the project may proceed.

The primary goal of a cultural resource inventory is to locate and describe archaeological, historic and cultural sites and to make a recommendation of significance when such sites are found. Archaeological sites, historic sites, and traditional cultural properties are known to occur in the Tenmile-South Helena project area. Significance evaluations of known cultural resources and new sites discovered during inventories of the project area would follow general guidelines as set forth below:

- 1) Cultural materials were observed in depositional or surficial settings where cultural remains may have been buried or disturbed in essentially their original positions, thus preserving spatial context.

- 2) Artifacts diagnostic of historic or prehistoric cultural periods were found. Presence of such artifacts allows dating of cultural components and establishment of temporal and cultural context.
- 3) Presence of diagnostic artifacts in potentially preserved context makes it possible for a site to contribute significantly to understanding of local and regional history and prehistory.
- 4) Historic sites were found to associate with the lives of person(s) significant to local or regional history. Such associations can be apparent through archival research.
- 5) Historic or prehistoric sites were found to contain well-preserved features such as buildings, roads, trails, tipi rings, cairns, effigies, pictographs, or petroglyphs. Such features may be representative of or associated with, an important period, and architectural style, an artistic style, or a unique or specialized activity.
- 6) Physical evidence of past or present cultural use of a locality for prayer, fasting, vision questing, piercing, burial, and other ceremonial activities were found. That evidence could include prayer cloth, rock structures, marked trees, sweat lodge remnants or hearths, or other lodge remnants. Presence of these things allow for identification of Traditional Cultural Properties.

Heritage, Affected Environment

Introduction

General Project Area

The sequence of cultural history within the Tenmile-South Helena Project area contains most of the usual phases from the Northwestern Plains chronologies. They will generally be referred here as the Prehistoric Period (Early, Middle and Late), Protohistoric Period and Historic Period. Details of the prehistoric periods will not be presented in detail since prehistoric archaeological sites or remains are limited in the project area. For more details on these cultural chronologies, the reader is referred to Overview: Ecological and Cultural Prehistory of the Helena and Deerlodge National Forest, Montana (Knight 1989), Prehistoric Hunters of the High Plains (Fison 1991), and Indian Creek Paleoindians: Early Occupations of the Elkhorn Mountains' East Flank, West-Central Montana in Ice Age Hunters of the Rockies (Davis and Greiser 1992).

The start of the Protohistoric Period overlaps with the end of the Late Prehistoric Period and ends with the arrival of the first Euroamericans in the Great Plains (Aaberg et al 2004). During this time period, European trade goods and horses generally reached Native American groups before full-scale contact. The influence of the Protohistoric Period, especially the horse, created competition for similar resources and territory (Aaberg et al 2004). As a result, complex tribal organization, alliances, and larger band size developed (Aaberg et al 2004). These tribal organizations belong to the anthropologically defined Northwestern Plains subdivision of the Plains Culture.

By the start of the Historic Period on the Plains, modern Native American tribal configurations and settlement patterns were in place. A number of tribes, beginning with the Flathead (Salish and Pend O'reille) in the 1600s, may have occupied central Montana during the Protohistoric and Historic Periods (Aaberg et al 2004). Around A.D. 1700, the Shoshone, who had acquired the horse earlier than other Montana tribes, pushed the Flathead west across the Continental Divide (Aaberg et al 2004). Soon other Plains tribes acquired the horse and displaced the Shoshone to the south (Aaberg et al 2004). Salish and Kootenai peoples continued to cross the Continental Divide for bison hunting opportunities in what was once their land. Common and well established oral histories among the Salish describe the bison rich Helena and Townsend basins along the Missouri River.

The Blackfeet became dominant in most northern Montana east of the Divide and in central Montana by the mid-1700s. Numerous historic accounts, most notably those of John Colter between 1807 and 1811, tell of encounters with the Blackfeet in the area of the headwaters of the Missouri River (McKay et al 2002:44-45). One tragic event that places the Blackfeet in the Helena Valley was the murder of prominent rancher Malcolm Clarke by several rogue members of Mountain Chief's band in 1869 (McKay 2002:44-45). That act led to an even more infamous incident, the Baker Massacre, in which the US Military murdered 173 innocent Blackfeet on the Marias River in north-central Montana in revenge for Clarke's murder (McKay 2002:44-45).

During the early 1800s, the Helena Valley served primarily as a stopping place for Native people on their way to and from buffalo grounds to the east and south. Salish and Nez Perce frequented the valley until their traditional enemies, the Blackfeet, drove them away. The Blackfeet were subsequently forced permanently to the north by pressure from Euroamerican trappers, miners and settlers. The Fort Laramie Treaty of 1851 designated the Helena Valley as a hunting area to be shared by all tribal groups.

The first Euroamericans to reach the Helena Valley were members of the Lewis & Clark expedition, who traveled through in 1805 and commented on the lush green grass that reached 24" height (McKay 2002:44-45). From then until 1860, fur trappers and traders viewed the valley as a crossroads for east-west and north-south travel (McKay 2002:44-45).

Congress appropriated money in 1855 for the construction of a 640 mile military wagon road between Fort Walla Walla, Washington and Fort Benton, the head of steamboat navigation on the Missouri River. The Mullan Road was completed in 1860. The future home-site of Helena was located a few miles from the road and it runs along a portion of the Tenmile-South Helena project boundary.

The Forest Service has a long history in the project area. Between 1905 and 1907 eight Forest Reserves were established near the plan area and by 1908 these Forest Reserves were combined into what is now known as the Helena and Lewis & Clark National Forests. The first several decades of Forest administration saw each Forest following similar trends as other national forest in the interior Northwest. Mapping of the plan area occurred along with the establishment of initial communication lines, fire lookout locations and administrative sites. The project area is dotted with this administrative

history, from historic survey corners and boundary markers to historic trails that appear on old maps, but are no longer managed.

South Helena Area

The well-documented gold strikes of southwestern Montana began in the early 1860s after establishment of the Mullan Road. In 1864, rich gold placers were discovered on Last Chance Gulch at the location of what would become Helena. As Helena developed into a mining center with a growing population, it did not take long for prospectors to begin exploring other gulches in the area.

The Historic Helena Mining District (24LC1186), which grew up around the finds at Last Chance Gulch, extends from 6 to 10 miles southwest of the city of Helena. Pardee and Shrader (1933) noted the Helena district was bordered by the Clancy and Rimini Mining Districts. The district encompasses Last Chance, Grizzly, Orofino, Dry and Nelson Gulches, all more or less famous in the histories of early placer mining. The period of significance for the Helena Mining District is 1864-1885. The period covers the gold rush era and large-scale development of the Park-Unionville lode mines. Last Chance Gulch was one of Montana's three major placer districts, the other two being Alder Gulch and Confederate Gulch (Koerth and Herbort 1999). The gold booms associated with these diggings were responsible for the settlement and early economic development of Montana Territory and, in the case of Last Chance Gulch, for the establishment of the city of Helena (Koerth and Herbort 1999). Unlike most placer camps that played out with the gold deposits, Helena survived the end of its placer boom in the early 1870s for a variety of reasons, one of which was the presence of active, viable lode mining in the district (Koerth and Herbort 1999). For this reason, the period of significance reflects not only the placer boom of 1864-1872, but also the era of flourishing lode mining in the Park-Unionville area that ended in the early 1880s (Koerth and Herbort 1999).

In 1864, a small group of men headed north from Alder Gulch for the rumored riches of the Kootenai (Koerth and Herbort 1999). Along the way they met a disillusioned miner named James Coleman who was returning from the Kootenai mines (Koerth and Herbort 1999). The group was convinced to change their plans and decided instead to prospect the Little Blackfoot where one of their members had found 'colors' the year before (Koerth and Herbort 1999). Although they traced the river to its headwaters and crossed the divide into Prickly Pear Creek, the party found only colors and no paying gravel (Koerth and Herbort 1999). Again changing their strategy, the party decided to prospect to the north. After six weeks of effort with little to show for it, the company returned south to the best of the earlier prospects on what they dubbed Last Chance Gulch (Koerth and Herbort 1999). On July 14, 1864 they dug two prospect pits on Last Chance Gulch upstream from their previous efforts. Both pits revealed flat gold nuggets and gold dust. The Last Chance Gulch discovery is generally credited to Hohn Cowan, Reginald Stanley, J.D. Miller and John Crabb. Later, these men would be known as the "Four Georgian" associated with their mining technique. Since they had the gulch to themselves, they tested up and down the stream to find the richest ground (Koerth and Herbort 1999). They held a miners meeting allowing 200ft per claim: with individuals other than the original discoverers limited to one staked claim and one purchased claim

(Koerth and Herbort 1999). Eventually, Crabb and Cowan were dispatched to Virginia City for supplies and the Last Chance bonanza period began.

Throughout the summer of 1864 small parties of miners left Virginia City and made their way to Last Chance Gulch (Koerth and Herbort 1999). Other miners, who were roving the hills prospecting, came upon the modest camp and stayed on to stake their own claims. But those who came stayed. Only a chronic lack of water limited the amount of gold that could be taken from the gulch. The completion of the Chessman and Cowan Ditch in 1865 allowed the gold to be sluiced at an even faster rate (Koerth and Herbort 1999). Little historical information has been found about the Cowan Ditch and the location is not known at this time. By 1868, only four years after the discovery, nearly all the sluices were gone from the gulch and a city stood on the played out placers (Koerth and Herbort 1999). In 1869 the few remaining placers in the gulch were worked by the Chinese (Koerth and Herbort 1999).

With the expansion of the mills and extension of gulch placers in late 1860s, in the project area, dozens of miles of ditches were hand-dug to bring additional water into the drainage, including the Tenmile (24LC1868) and Park Lake ditch (24LC1048/24JF0726). The Park Lake system also involved the construction of heavy timber dams to raise the level of Park Lake, and the damming of Beaver Creek to create Chessman reservoir.

The most significant contribution to the growth of Helena's population and the base capital of the historic mining district (24LC1186) circa 1865-1880, was placer mining. The most significant contribution to placer mining in the Helena Mining District were the countless mining ditches, most notably The Park Ditch (24LC1048/24JF0726). The ditches were essential to placer mining since they functioned in the absence of perennial streams to provide flowing water necessary to keep the mines in operation. The ditches allowed for expansion of the mining industry which in turn provided for the expansion of Helena's population and wealth. Were it not for these ditches, most placer mining operations would have been forced to remain only seasonal ventures that would not have resulted in any significant growth of the industry, citizenry or capital.

The Park Ditch (24LC1048/24JF726) is the most well-known placer ditch in the South Helena area. The people associated with capital investment and construction of the Park Ditch were significant to the growth of Helena. Local aristocrats John Ming, Sam Hauser, Alex Woolfork, Robert Hale, and A.M. Holter were all moderately wealthy citizens who invested heavily in several local ventures that helped develop the fledging town. These investors formed a corporation, The Park Ditch Company. In 1871 the Park Ditch became involved in a political fight between two very significant persons to Helena's past. E.W. Toole, a Democrat, was running against William Clagett, a Republican, for a Territorial Delegate seat. In July of that year, some local miners were claiming that they were being "frozen out" of water from The Park Ditch. E.W. Toole had controlling interest in the Park Ditch Company and was accused of charging exorbitant prices for the water. The ensuing political mudslinging made front page headlines and entangled The Park Ditch in a political controversy between two of Helena's most significant personages. The Park Ditch may or may not have influenced the outcome of the ensuing election, but both Unionville and Helena voted Republican.

Again in 1872, the Park Ditch (24LC1048/24JF726) was the subject of two court cases involving even more prominent and significant people in the history of Helena. The first case, W.W. Johnson vs. The Park Ditch Company, involved W.W. Johnson, the ditch's original contractor and a very prominent figure, who sued the Company because he claimed 1) no actual survey was done prior to the contract therefore no exact length of the ditch was set, and 2) the company took possession of the ditch before it was actually completed. The court case was eventually dismissed by the judge, who ruled that both sides defaulted on the original contract.

The second court case that involved The Park Ditch (24LC1048/24JF726) centered around one of Helena's most well-known figures, and a principle trustee of the Park Ditch Company, Mr. Robert S. Hale. Hale loaned money to the company to build the ditch to the Tucker Mine. He also held the mortgage on the ditch. Hale then foreclosed on his mortgage gaining him total ownership of the ditch and bought the rest of The Park Ditch property for \$10,500, when the original cost was over \$40,000.

The Park Ditch (24LC1048/24JF726) is a representative example of engineering techniques circa 1870. The ditch begins with a "feeder" that flows from Frohner Meadows into Park Lake, then exits the lake and meanders through some 22 miles of steep-sloped, rugged terrain across Grizzly Pass and down into several gulches at the south end of Helena. A walkable trail along the downslope side of the "feeder", composed of excavated dirt, provides an excellent opportunity to view the ditch along its mile course from Frohner Meadows to Park Lake. Due to its restored condition this portion of The Park Ditch (24LC1048/24JF726) more than any other truly comprises not only the distinctive characteristics of engineering and methods of construction circa 1870, but also a feeling of association with Helena's historic mining past.

Documents for The Park Ditch Company in the Archives at the Montana Historical Society detail construction specifications that contractor W.W. Johnson was to follow. The Park Ditch still retains much of its original dimensions as constructed in 1870. The ditch is still four feet wide, roughly twenty inches deep, and two feet wide at the base, is graded almost exactly twelve feet to the mile, and most importantly, still contains the excavated dirt pile adjacent to the ditch on the downslope side. It is this dirt that today provides a walkable trail along the entire course of the resource. The Park Ditch (24LC1048/24JF0726) was determined eligible for listing in the National Register of Historic Places in 1984 because it possess an unusually high level of integrity of location, design, setting and workmanship for a resource 112 years old (a 143 years old now)

From Grizzly Pass several ditches would exit off the main line that ran down to Orofino Gulch. These ditches would be constructed at various times as dictated by need and probably capital investment. It is likely that many other ditches lay within the project area and their association with The Park Ditch is probable.

Lode mines of the Helena Mining District (24L1186) provided a more enduring, albeit less glamorous, source of gold. As placers were taken up in Last Chance Gulch and the nearby gulches, miners moving south discovered lode deposits: the Whitlach-Union mine in Orofino Gulch and later, the Spring Hill mine in the adjoining Grizzly Gulch (Koerth

and Herbort 1999). Lode mining was limited almost entirely to these two mines (Koerth and Herbort 1999).

The town of Helena was in a constant state of rebuilding after a series of devastating fires: April 1869, November 1869, October 1871, August 1872 and January 1874 (Koerth and Herbort 1999). These fires left a legacy of stone and brick fire-proof buildings in the gulch (Koerth and Herbort 1999). Many of the stone buildings were quarried in the nearby hills in what is now the Helena National Forest. Stone quarries have figured prominently in the development of Helena (Schultz 1998). With an abundance of locally accessible building stone, Helena quickly developed commercial buildings and stately mansions that are still evident today. Helena's stone quarries have received ample recognition, but in title only. Very little information concerning actual quarries, quarryman and quarrying technology can be found in publications. The most prominent quarry in the project area is the historic Tucker Gulch granite quarry (24LC1287). The site also known as the Black Granite or Dry Gulch quarry, is the remnant of a historic-period granite quarry developed and used by the Kain Granite Company of Helena from the 1920s-1940s (Schultz 1998). Today, the site is composed of approximately 1.5 acre quarry area; a vertical boom with metal cable guide wires tied to large trees and boulders; drilled granite waste rock; several rock walls and flat loading areas; and metal refuse. Given the prominent use of granite in Helena coupled with the quarry's association with the Kain Granite Company operations, the Tucker Gulch quarry was determined to be eligible for listing in the National Register of Historic Places in 1996.

Along with the quarries several lime kilns ruins are still evident in the gulches of South Helena. These brick and mortar kilns were used to manufacture quicklime from native limestone before the turn of the 20th Century. Those near the junction of Grizzly and Orofino Gulches lie on private property but others can be found nearby on National Forest land. Limestone could be readily quarried from highly visible outcrops located directly above or nearby the lime kilns. The limestone was removed by drilling, blasting and minor above-ground excavation.

The Helena lime kilns are called continuous kilns (Axline 1995). In essence, they are vertical furnaces made of mortar, brick, wire cable and wood poles (Axline 1995). The square-shaped kilns had openings at the top and at the base (Axline 1995). Alternate layers of wood fuel and quarried limestone cobbles were stacked inside the kiln, and fired at a high temperature (Axline 1995). Wood and limestone were continuously fed into the top of the kiln while the resulting quicklime was shoveled from the bottom kiln mouth into wood barrels (Axline 1995). Sheds (which have long since disappeared from the Helena ruins) were attached to the kiln mouths to protect the barrels of raw and volatile quicklime from moisture.

Tenmile Area

Placer mining activities in the Tenmile area reportedly began as early as 1864. John Caplice is credited with establishing the first mine in the Tenmile drainage near Lee Mountain (Rossillon 2000). Lode mining began in the Lee Mountain area before 1870 (Aaberg et al 2004). Placer mining was limited to areas of the Tenmile drainage near the Continental Divide and along some tributaries including Minnehaha and Monitor Creeks.

Although placers were worked for a time, it soon became clear that gold was not nearly as plentiful as in the placers of Last Chance Gulch (Aaberg et al 2004). Lode mining increased in the 1870s as it became apparent that rich placers were not abundant. In fact, the Rimini area soon gained a reputation of having some of the state's best lead/galena and zinc deposits, and lode mining began focusing on these minerals (Horstman 1998).

Earliest settlement in the Tenmile area was upstream from the present location of Rimini in the area near the confluence of Beaver Creek and Tenmile Creek and the Lee Mountain Mine (Aaberg et al 2004). A 1919 article in the Anaconda Standard recounts the story of a catastrophic flood in the Tenmile drainage when the dam impounding Chessman Reservoir at the head of Beaver Creek collapsed in 1879 (Wilkinson 1919). The Helena Independent and the Helena Weekly Harold also give accounts of the flood in August 9 and August 10, 1876 issues of the newspapers. The catastrophic flood occurred on August 8, 1876. The Anaconda Standard article states that only a few cabins were present in the Tenmile valley along with the old Hoyt quartz mill that stood on the west bank of Tenmile (Wilkinson 1919). The story of the flood was told to the reporter by John Francis Wilson and William Coyne, both early miner's in the Tenmile area, and both who witnessed the flood, narrowly escaping with their lives. It is clear from this article that Rimini did not exist in 1876. In one passage the article states "Very few people lived in Upper Tenmile valley and it was fortunate that such was true" (only three people lost their lives in the flood).

Near the end of the page-long Anaconda Standard article the following statement appears, "Many years have passed since the great overpowering flow of pent-up waters flooded Ten Mile valley" Rimini has been built since then and is a small mining town at the base of Red Mountain and near the junction of Beaver Creek with Ten Mile, where the impact of the flood was greatest". The Anaconda Standard article offers little doubt that Rimini, or any other town, did not exist prior to the collapse of Chessman Reservoir.

What the Anaconda Standard, Daily Independent, and Weekly Harold articles and additional documents tell us, is the city of Helena had a vested interest in the Ten Mile Creek drainage and Red Mountain area very early on. Tenmile Creek and Chessman Reservoir were among the early water supply sources for Helena, but not the only source. Exactly when Chessman Reservoir and Tenmile Creek became part of the water supply system has not been clearly established. What is known is that William A. Chessman was an early water developer in Helena and founded the Helena Water Works Company. A 1911 deed that records sale of the Helena Water Works Company assets to the City of Helena references district court water rights adjudications in November 1864 and February 1865 that awarded water rights to "The Helena Water Works Company, et. al." (Aaberg et al 2004). An 1899 promotional brochure published by the Helena Water Works Company was found by Aaberg in the State Library at the Montana Historical Society in July of 2003. This brochure presents a brief history of Helena water system properties and describes the following:

The evolution of the present system of water works in Helena has been like that of the city itself. It began when tents and shacks were first occupied by miners, and when water was peddled from carts, - in the laying of a few perforated logs down the main street. When Helena reached the dignity of subdivisions, lots,

and frame houses, the “Hale” reservoir, with iron distribution pipes, was constructed for the East Side, the “West Side Boys’ system”, and the “Eureka” system for other parts of the city. Later, when stone and brick blocks were rising, the “Woolston” system, with its fire service covering the whole city, was built under a special franchise. Still later, as the importance of Helena was developing, came the consolidation of all these systems, the purchase of rights on “Ten Mile Creek”, and the expenditure of over a quarter million dollars in bringing its waters into the city through iron mains and enlarging and perfection the distribution system.

A brief history of the Helena water supply system is presented on the City of Helena website. This history was compiled by employees of the Water Treatment Division of the city’s Public Works Department. After a long running feud between The City of Helena and the Helena Water Works Company, the city acquired the water supply system for \$400,000.00 from the Helena Water Works Company on October 3, 1911.

The 1897 Helmick map shows a water supply ditch extending from the mouth of Minnehaha Creek down Tenmile valley to a settling reservoir that is in approximately the same location as the present treatment plant and reservoir. Large segments of this old city water supply ditch (24LC1868) are still present in the project area. This ditch (a few segments supported an above-the-ground flume) may be the oldest historic feature in the Tenmile drainage. The Old Helena Water Supply Ditch (24LC1868) was recommended eligible for listing in the National Register in 2004 due to its association with the earliest municipal water supply for the city of Helena.

Early mining ventures in the Tenmile area were undertaken by individuals, groups and small companies. By the early 1880s, lode mining had increased enough and was profitable enough, to attract the attention of larger companies and wealthier investors. This interest from corporate entities was likely in part related to the expansion of rail systems into Montana and the potential they offered in shipping metal ores to processing facilities. By 1883, the Northern Pacific Railroad (NPR) reached Helena and Jim Hill’s Montana Central Railroad (MCR) was not far behind (Aaberg et al 2004). There is no question that a community had sprung up in the location of where Rimini is now by the early 1880s. In addition to residence, Rimini has several boarding houses, two hotels, a saloon, and a school by 1884. By 1884, a post office had opened that was officially named Rimini. Railroad associates of the NPR and MCR were referring to the community of Rimini by the time they began considering pushing a spur line up Tenmile valley to the Red Mountain claims.

Competition between NPR and Hill’s MCR associates reached a critical point by 1886 in the Helena and Rimini areas when it was obvious that both parties were aware of each other’s plans for a spur line to Red Mountain. Numerous MCR right-of-way acquisitions for the Rimini branch appear in the legal section of the Helena Independent record in the spring and early summer of 1886 (Aaberg et al 2004). Interestingly, the MCR was chartered and Rimini right-of-way was secured even before Hill’s main MCR line entered Montana. MCR had beaten the NPR in the race to secure right-of-way for easiest passage of the railroad up the Tenmile Creek valley, generally on the valley floor. If the NPR was going to build a spur line to Rimini, they would have to take a more difficult route on

valley slopes where bedrock sometimes intruded and where more involved bridge building was required (Aaberg et al 2004).

MCR began construction of the grade into Rimini during the spring and early summer of 1886. Whether an overly competitive spirit drove the NPR, or whether they knew they had Hill over-a-barrel because he would be required to ship the rails for building the line on their railroad, the NPR went ahead with plans to build their own spur (Aaberg et al 2004). Apparently, construction on the MCR grade began first but work on the NPR grade began soon after (Aaberg et al 2004). For the first seven or eight miles out of Helena, there was enough relatively flat ground for both railroad companies to secure right-of-way that would allow relatively easy construction of the grades. Both grades can still be seen paralleling each other, only yards apart, from where they intersect US Highway 12 extending southwesterly toward the mouth of Tennmile Creek canyon. It was only where the rail lines entered Tennmile Canyon, about two miles from the present intersection of Rimini Road with US 12, that the right-of-way problems arose for the NPR.

The MCR secured right-of-way along the valley floor required relatively little modification of the existing ground surface before raising the grade since it generally ran along the level floodplain (Aaberg et al 2004). Because of the narrowness of the canyon, there was only room for one railroad grade on the valley floor. The alternative route would be more expensive and time-consuming to construct, requiring cutting along valley slopes, and on occasion, blasting through bedrock (Aaberg et al 2004). The final route for the NPR grade from the mouth of Tennmile Canyon to Rimini lay along heavily timbered slopes where much cutting and grading had to precede construction of the grade. The old NPR grade (24LC1268) has survived in Tennmile Canyon and many stretches exhibit beautiful rock retaining walls that were constructed to protect the rail bed where it cut through slopes. Several cuts through solid bedrock are also evident as are some stretches with immense fill over drainage and slopes, where the elevated final grade surface is as much as 25' above the original ground surface. The Montana Central Railroad Grade (24LC1866) was recommended eligible for listing in the National Register in 2003.

For whatever reason rails were never laid on the MCR grade, possibly because NPR was charging an unusually high freight rate (\$35/ton compared to the usual \$20/ton) to get rails to Helena (Aaberg et al 2004). This allowed the NPR to complete its line to Red Mountain and the first NP train chugged up Tennmile valley into Rimini in December of 1886 (Aaberg et al 2004). The NPR dubbed its new spur line the Helena to Red Mountain Line (24LC1268) and offered daily freight and passenger service between Helena and Rimini (Aaberg et al 2004). The Helena-Red Mountain Railroad Grade (24LC1268) was determined eligible for listing in the National Register in 2003.

Once it became known that the MCR was not going to lay tracks on the spur they had constructed, area residents and merchants began using the grade as a road (Aaberg et al 2004). The MCR grade (24LC1866) became a more popular route for traveling than the old wagon road (24LC1867), which ran along the west valley slopes following a route nearly identical to that of the NPR line (Aaberg et al 2004). By 1908 citizens had formerly petitioned to have the old MCR grade designated as the official county road

providing access to the upper Tenmile Creek area and the road has been maintained by the county ever since (Aaberg et al 2004).

The old Rimini wagon road (24LC1867) is still evident, often paralleling the NPR grade. The old wagon road occasionally exhibits rock work where retaining walls and grades were constructed and where the road passes through rocky slopes, but in many instances the road is nothing more than a narrow cleared strip in the forest. It is quite possible that this old road dates to the time the Helena Water Works Company had constructed Chessman Reservoir and water supply ditch along Tenmile Creek in the late 1860s. The Old Rimini Wagon Road (24LC1867) was recommended eligible for listing in the National Register in 2003.

By 1925, the Rimini NPR spur was not in use and the Interstate Commerce Commission “decreed abandonment of the line” (Aaberg et al 2004:32) and the tracks were pulled up shortly thereafter. The removal of the NPR line sealed the fate of Rimini and population began to decline in the canyon.

Along with the colorful mining, city water and railroad competition history, the Tenmile valley has a long history in federal government. The Moose Creek Ranger Station (24LC1608) lay on the east side of Tenmile Creek near its confluence with Moose Creek. The first date of construction for this facility has not been clearly established although a 1908 GLO map for the township and range does not show any structures at the Moose Creek location. A 1916 map of the Tenmile watershed and the Helena National Forest map designate just over 160 acres of land in the sections 20 and 21 as the Moose Creek Ranger Station. This 1916 map clearly indicates the tract withdrawn for administrative purposes, but does not show structures on the tract (Aaberg et al 2004). In reviewing US Census Bureau statistics between 1910 and 1920 mentions that one new occupation that appears for the Rimini area is that of a forest ranger (Aaberg et al 2004). The Forest Service has maintained a presence in the Tenmile ever since. The Moose Creek Ranger Station (24LC1608) was determined eligible for listing in the National Register in 2001.

As an attempt to improve the effects of the depression the economy and the population of the United States, The Roosevelt administration began the New Deal reform through which the spending and regulatory powers of the government were used as tools to funnel work and funds to all fifty states (Aaberg et al 2004). One of the most popular and widespread programs of the New Deal was the Civilian Conservation Corps (CCC), which was created in 1933 and terminated in 1942. When the CCC was set up, it was envisioned that the US Forest Service would play a large role in operating crews and camps. CCC forest camps would undertake construction of fire tower lookouts, fire breaks, forest foot trails, forest bridges and roads, ranger and administrative buildings, and would carry out reforestation in a number of areas.

A CCC forest camp was approved for the Helena National Forest by the mid to late 1930s and in late spring of 1939 officers from Fort Missoula traveled to the Tenmile valley to select a location for the new camp (Aaberg et al 2004). Construction began soon after that visit at a location on Tenmile Creek, about two miles downstream from Rimini. The camp was completed by June 1, 1939 and was opened on June 11 of that year (CCC 1940). It was designated as Forest Camp 79 or F-79. The camp was officially named

Camp Rimini but was sometimes referred to as Tennmile Camp or as the Moose Creek Work Center (Aaberg et al 2004).

In early June of 1939, 150 enlistees from Fort George Wright were transported on the NPR to Helena and from there on to Camp Rimini (Aaberg et al 2004). The actual number of men who occupied Camp F-79 at any one time varied some, although initially it was home to 150 enlistees and additional administrative and supervisory staff. The Camp Rimini population thus probably approached 200 men when it first opened.

Camp layouts followed a pattern and included barracks, mess hall, motor pool, infirmary, administrative headquarters, officer and staff quarters, recreation hall, and classrooms. The CCC district Quartermaster shipping ticket of September 16, 1942 presented an inventory of all items at Camp Rimini when it was being transferred to the military in preparation of opening a sled dog training camp. This ticket listed 27 buildings; all but one of which is described as frame portable buildings (Aaberg et al 2004). The list includes five barracks, a mess hall, two technical service quarters, on technical service office and supply building, an Army office and supply facility, a welfare building, a dispensary, two lavatories, four garages, an oil house, a blacksmith shop, an educational building, two pump and generator houses, a maintenance shop, a barber shop, and a laundry.

No buildings survive from the CCC camp (24LC0935). However, a number of concrete foundations, steps, and walkways are still present. These remains can be seen on both sides of the old NPR grade just south of the Moose Creek Campground. The locality has been used in recent years a Boy Scout camp and as a snowmobile parking lot.

The entrance of the United States into World War II in 1941 resulted in yet more historical activity in the Tennmile valley. CCC camp F-79 was still operating in December of 1941 but by April of 1942, the decision had been made to close the camp (Aaberg et al 2004). Camp F-79 opened relatively late in the history of the CCC and stayed open longer than many camps in Montana. Camp Rimini would likely have been in good condition though 1942 because of recent closure. It was this fact, as well as its setting in a relatively high elevation mountain environment, that led the military to select the old CCC camp for conversion to the dog-training facility (Aaberg et al 2004).

The Quartermaster Corps was authorized by the Department of Agriculture to convert the CCC camp to military use in September of 1942 and work began on the facility by October of that year (Aaberg et al 2004). The camp was officially designated as a War Dog Reception and Training Center that specialized in training sled dogs and pack dogs (Aaberg et al 2004). Construction on the camp progressed swiftly and included conversion and rehabilitation of existing CCC buildings as well as construction of new buildings. The camp was designed to accommodate between 750 and 900 large breed dogs as well as about 235 personnel including 150 enlisted trainees, 50 permanently assigned enlistees, 15 instructors, 9 officers, 7 veterinarians, and 4 employees (Aaberg et al 2004).

Initially, the Allies had planned to retake Norway and felt sled and pack dogs would play an important role in the task. So to begin with, there was some urgency in making Camp

Rimini an operable dog training facility. However, by 1943, the plans for reinvasion of Norway had been cancelled and Camp Rimini administrators refocused on supplying men, dogs, and equipment for the Arctic Search and Rescue Units (Aaberg et al 2004).

Training of sled dogs at Camp Rimini was not seasonal but was a year round undertaking. During the warm seasons when snow was not available, trainers used Rimini Road where dogs were hitched to old car chassis (Aaberg et al 2004). Some historic photographs also appear to show dogs, trainers, and trainees on the old NPR grade, which ran through Camp Rimini. More extensive training trails, reaching considerable distances, were established and led from Camp Rimini to Butte, Deer Lodge, and to the Elliston-Avon area (Aaberg et al 2004).

The need for sled dogs diminished through the war and by 1944, training operations were consolidated and transferred to Fort Robinson, Nebraska and Fort Royal Virginia; Camp Rimini was then closed at the end of March (Aaberg et al 2004). Soon after closing, administrative control of Camp Rimini was transferred to the Helena National Forest. The Forest Service held a public sale and many of the more portable buildings were sold (Aaberg et al 2004). The HLCNF retained a few of the buildings for use in the area, but most were eventually moved to other Forest Service locations. Camp Rimini (24LC0935) was recommended as eligible for listing in the National Register in 2003, due to the fact that it maintains integrity of historic association and historic events related to the Civilian Conservation Corp, War Dog Reception and Training Centers and the Great Depression.

Analysis Area

For purpose of this analysis, the cumulative effects project area boundary is used as the general “heritage analysis area” where contextual research and background record checks provide the information on the existence of or potential for, the occurrence of cultural resources. Within this broader analysis area, a site specific “area of potential effect” (APE) is intensively analyzed under NHPA Section 106 review process. The APE includes treatment units, landings, road construction, and a buffer zone of 50 feet beyond these areas. Where a cultural resource is partially located within the APE, the effects analysis must be expanded to encompass the entire site (including a buffer). The exception is linear features (such as historic ditches), where the majority of the feature is well outside of the project area. Only the portion of the linear feature that is within the APE will be addressed for the Tenmile-South Helena proposal. However, a large portion of The Park Ditch (24LC1048/24JF726) is located outside of the project area, but the entire length is known, and therefore will be analyzed.

Heritage, Environmental Consequences

Effects Common to All Alternatives

Cultural resources are non-renewable resources. Continued natural weathering and deterioration cannot be avoided. Regardless of the alternative selected environmental factors, such as wildfires, erosion, snow load, and weather exposure contribute to the deterioration of various types of cultural sites located within the project boundary.

In the Tenmile-South Helena Project APE 152 cultural resources have been identified during previous project level inventories. Of those cultural resources 8 have been determined eligible for listing in the National Register of Historic Places and are listed in Table 245. The remaining cultural resources are unevaluated and will be treated as eligible until an official determination can be made.

Table 245. Eligible Cultural Resource within APE

Smithsonian Number	Site Name	Site Type	National Register Status
24JF726/24LC1048H	Park Ditch	Historic Ditch	Eligible
24LC1867H	Old Rimini Wagon Road	Historic Road	Eligible
24LC1866H	Montana Central Railroad Grade	Historic Railroad	Eligible
24LC0101/PW1094	Beatrice Mine	Historic Mining	Eligible
24LC0935	Camp Rimini	CCC Camp/War Dog Training Center	Eligible
24LC1608	Moose Creek Ranger Station	Historic Ranger Station	Eligible
24LC1268	Helena-Red Mountain Railroad Grade	Historic Railroad	Eligible
24LC1287	Tucker Gulch Granite Quarry	Historic Quarry	Eligible

Effects Common to All Action Alternatives

Less than 10 percent of the Tenmile-South Helena Project APE has been inventoried for cultural resources. Cultural resources are non-renewable resources; therefore NHPA Section 106 inventories will be required prior to any on the ground action alternative implementation. Positive effects of the action alternatives to heritage resources include an opportunity for the Forest to monitor eligible cultural resources, a reduction in fuel loading, and the management of control lines to reduce the risk of wildfire. These actions all help in protecting the cultural resources of the Helena National Forest by getting our program closer to its desired conditions. That is all moderate-to high probability terrain could be inventoried for cultural resources and the results documented. Any moderate-to high probability areas that received surveys prior to 2005 could be re-examined. Eligibility of unevaluated sites and newly recorded sites could be determined in consultation with SHPO prior to project implementation. The existing or desired condition may be further enhanced if project activities (under-burning, vegetation removal) reveal additional significant features of the Rimini and Helena Historic Mining Districts (trails, railroad grades, ditches, camp locations, etc.).

Mechanical treatment has the greatest chance to cause ground disturbance, therefore units proposed for improvement harvest, regeneration harvest and pre-commercial thinning will need the highest amount of Section 106 inventories to achieve compliance. Generally we are able to employ a Stratified Inventory Strategy based on slope, due to the fact that humans don't usually occupy slopes greater than 20 percent. However, historic sites associated with mining do not have the same constraints. Historic adits, shafts, ditches and mill structures routinely occur on steep slopes. For this reason, all proposed timber harvest units are considered to be within the Area of Potential Effect (APE) for

cultural resources and would need on the ground inventory coverage. It should be noted, that past experience has shown that some environmental conditions, such as dense downfall, thick new vegetation growth and un-safe slope conditions, produce a low confidence level for cultural resource inventories due to poor ground visibility. In this type of situation, a post implementation inventory could produce a higher confidence level.

As currently designed the private land buffer units do not have a known prescription, which means there is potential for ground disturbing activity. For this reason the private land buffer units would be considered within the APE for cultural resources and would need on the ground inventory coverage.

For the proposed prescribed fire treatment units, we recommend implementing the 2-phased methodology spelled out in our East Side Forest Site Identification Strategy (1995). This approach requires a pre-survey records search to identify above ground, combustible historic properties and any areas where cultural resources would be expected to occur (SIS 1995). The Phase 1 inventory strategy focuses on locating expected sites identified through the records search. Furthermore, the Phase 1 methodology consists of intensive-level inventory of a minimum of 10 percent of the proposed prescribed fire APE. The Phase 2 would consist of a post-implementation “monitoring” type inventory resulting in a 20 percent minimum coverage of the entire prescribed fire APE. The result being a 30 percent sample of the undertakings’ prescribed fire APE.

The Bureau of Land Management (BLM) units currently have received no inventory coverage.

Alternative 1 (No Action)

Direct/Indirect Effects

Under alternative 1, no new direct effects would occur. Cultural resources would continue to be vulnerable to the effects of fuel loading within the project area, increasing the risk of wildfire. Cultural resources would continue to naturally deteriorate over time, and would continue to be threatened by natural processes (wildfire, erosion) and from recreational activities that bring people in contact with cultural sites.

Wildfires have a negative effect on fire-sensitive cultural resources due to high temperatures, an inability to control the effects, and because resource inventories cannot be conducted in advance. While many types of cultural resources can survive low-severity fires with little or no damage, high-severity fires destroy or damage a wide range of cultural sites and artifacts. In addition, fire suppression activities such as bulldozer-created control lines, hand lines, and fire retardant drops all have the potential to destroy or damage cultural resources. Also, wildfires cause erosion through vegetation loss, resulting in resource deterioration by destroying the spatial context of a site. Vegetation loss may also inadvertently lead to increases in vandalism and looting of newly exposed cultural sites. The high temperatures of wildfires cause rapid surface weathering of features and artifacts, accelerating loss.

Irreversible/Irretrievable Commitments

There would be no irreversible or irretrievable effect to cultural resources since no actions associated with this project would occur, however failure to reduce the accumulated fuels would increase the potential for severe wildfire, increasing the potential for adverse effects by fire to cultural resources throughout and beyond the Tenmile-South Helena project area particularly trails, structures and combustible artifacts and features. If a severe wildfire event required suppression actions, those actions (hand lines, dozer lines or other ground-disturbing actions) could result in damage to archaeological features within the project area.

Cumulative Effects

Since no actions would be done under this alternative there would be no cumulative effects.

Alternative 2

Direct/Indirect Effects

Direct effects to cultural resources are those that physically alter, damage, or destroy all or part of a resource; alter characteristics of the surrounding environment that contribute to the resource's significance; introduce visual or audible elements out of character with the property or that alters its setting; or resource neglect to the extent that it deteriorates or is destroyed (USDA Forest Service 2005: III-411). Alternative 2 has the potential to directly affect cultural resources within the proposed project area, if site specific resource protection measures are not developed and monitored. The anticipated impacts to cultural resources could include vegetation thinning and prescribed burning. For example, felled trees can damage or destroy features and historic structures by reducing the site integrity. Burn treatments have the potential to adversely affect cultural resources by burning historic structures and damaging or destroying artifacts and features within known site boundaries.

In addition, direct effects from the Tenmile-South Helena Project area may include increased site access and exposure to the elements, which could result in a greater chance of looting. The proposed treatments would cause temporary loss of vegetation cover, which has the potential to cause erosion, increasing artifact displacement and collecting, if artifacts are exposed. Mechanical harvest requires timber felling, hauling, dragging, and lifting of downed logs to landing and/or decking areas. These activities churn-up soil and thus cause ground-disturbance that could affect archaeological sites and historic ruins located atop or buried within the forest duff and soil matrix.

Hand treatments (lop and scatter fuels) are less likely to affect cultural sites than prescribed burning and mechanical harvest. Still, a minor amount of soil disturbance often occurs in areas where the resulting slash is piled and burned. Prescribed burning to reduce fuels loading and remove encroaching vegetation has an obvious adverse effect to any cultural resource composed of wood or other flammable material. Construction of containment line may also cause minor ground disturbance.

The construction and reclamation of temporary access roads and log decks can cause ground disturbance that adversely affects cultural resources. For example, under alternative 2 a New Haul Route is proposed which crosses The Park Ditch (24JF726/24LC1048H) in Section 8, which could adversely affect a National Register Eligible site if protection measures are not followed and monitored. In addition, a main haul route in the same area runs directly adjacent to The Park Ditch and proposed road improvements have the potential to affect the ditch negatively. In all cases, effects to prehistoric and historic sites could be avoided during project redesign and follow up through implementation.

Indirect effects under the current proposal are related primarily to reducing the risk of wildfires in the project area. Adverse effects to cultural resources tend to be greater in wildfire situations because of high temperatures, an inability to control the effects, and because resource inventories cannot be conducted in advance (USDA Forest Service 2005: III-413). In addition, wildfires may cause erosion through vegetation-cover loss, resulting in resource deterioration. Vegetation-cover loss may also inadvertently lead to increases in vandalism and looting of cultural sites. The high temperatures of wildfires cause rapid surface weathering of features and artifacts, accelerating loss.

Under alternative 2 a total of 964 acres (21 units) have been reviewed under the NHPA Section 106 process. However, only 2 of those units have received full inventory coverage. The remaining 19 units have received 5%-70% inventory coverage. A total of 21,729 acres (276 units) still need some level of Section 106 review before implementation of this project. Of these 6,472 acres (103 units) are proposed for mechanical timber harvest and 2,191 acres (45 units) are private land buffers treatment. A total of 13,066 acres (120 units) are proposed for prescribed fire and will receive a 30 percent inventory per our Stratified Inventory Sample.

Currently, 54 units under this alternative will need resource protection measure for known sites, see Appendix B of the Fisheries Report for draft resource protection measure recommendations. Additional units could be added as Section 106 inventories are completed and more sites are recorded.

In order to be in compliance with NHPA Section 106 and to complete the effects analysis for cultural resources as described in 36 CFR 800, additional inventories are needed. Table 246 provides a summary of APE acres for alternative 2, which will need additional cultural resource inventories. However, for the purposes of NEPA, the extensive literature search, consultation and sample inventories provide enough information to establish the likely presence of cultural resources for this alternative. If treatment units are designed to avoid cultural resources or resource protection measures are agreed upon, then alternative 2 would have little potential to directly affect cultural resources, provided that project activities are confined to the proposed treatment acres, haul routes and landings.

Irreversible/Irretrievable Commitments

Removal or disturbance of previously identified or unidentified cultural resources would result in irreversible and irretrievable loss of data. However, there would be no

irreversible or irretrievable effect to cultural resources as a direct result of implementing this project since all known archaeological sites would be protected. Indirectly, vegetation management may increase public access and as a consequence, enhance opportunities for artifact collecting and vandalism. Vegetation management may inadvertently expose previously undiscovered prehistoric or historic sites damaging their context. Context in archaeology refers to the relationship that artifacts have to each other and the situation in which they are found. Every artifact found on an archaeological site has a precisely defined location. In addition, it is possible that exposed artifacts and/or features would be observed and not reported to the Forest Service, thus providing opportunities for future artifact collecting and vandalism. When people remove an artifact without recording its precise location the context is lost forever and the artifact has little or no scientific value. This context is what allows archaeologists to understand the relationship between artifacts on the same site, as well as how different archaeological sites are related to each other.

Cumulative Effects

For all alternatives, the area of analysis is the extent of Forest Service land in the Tennmile-South Helena project area. A diverse panel of Forest resource specialists compiled a report and maps of connected past, present and reasonably foreseeable actions or events that have altered or could alter the project area's natural and cultural landscapes. Cumulative actions initiated by the Forest relevant to cultural resources include timber harvests and tree thinning; prescribed burning and wildfire suppression; weed and grazing allotment management; and minimal recreation developments. Actions and events not initiated by the Forest include climate conditions, insect infestations, wildfires, and aspects of grazing, firewood cutting, post and pole cutting, and recreation. These actions cause increased exposure of sites due to loss of vegetative cover, soil compaction or erosion, looting, and changes to routes and use patterns of historic linear features.

This alternative improves cultural resource protection in the Tennmile-South Helena project area in the short- and long-term. See below for a description of Past, Present and Reasonably Foreseeable Future Actions.

Past Actions – The Helena Valley, and its adjacent foothills and mountains, has supported livestock grazing, logging, mining, recreation and utility development during the last 150 years. These activities and particularly the road construction associated with them, have exposed, and in some cases damaged, cultural resources. However, it is difficult to quantify the effects of these past actions on cultural resources in the Tennmile-South Helena Project area.

Since the late 1970s, cultural resource inventories have preceded all ground-disturbing Forest Service projects in the Tennmile-South Helena Project area including vegetation treatments, livestock grazing, restoration, and recreation development. The majority of the cultural resources described in this analysis were discovered as a result of these compliance inventories. In fact, many archaeological sites were found because they were exposed in old road and trail beds. In most cases, project boundaries and treatments

would be reconfigured to avoid impacting significant cultural resources so the cumulative effect of these actions on cultural resources would be relatively minor.

Present Actions – Cultural resource inventory and evaluation have preceded restoration work, fencing, weed treatment, road and trail repairs, reforestation and stock watering repairs. Ongoing forest activities would continue to have a cumulative effect on cultural resources. All forest actions require NHPA and consultation therefore the effects on cultural resources would be mitigated through project redesign and/or avoidance. Roads and trails have been constructed through archaeological and historic sites over a period of many years. Regardless of alternative, road use has the potential to degrade cultural resources, particularly prehistoric archaeological sites. Cultural resources exposed in roadbeds and borrow pits invite illegal artifact collecting.

Reasonably Foreseeable Future Actions – Future actions in the analysis area will likely focus on public safety and environmental health and include fire and watershed restoration, hazardous fuels reduction, abandoned mine reclamation, and minor recreation developments, and mineral operations. In all likelihood, the effects of these projects on cultural resources can be mitigated through project re-design and avoidance.

Cumulative effects background is provided above. This alternative would invoke more vegetation management activity in the drainage. This would add to the cumulative effects of FS management activities on cultural resources in the Tenmile-South Helena project area since the turn of the century. The current known and anticipated cultural resources in this area are very high, whether for historic mining, homesteading and other ruins. Further, the direct and cumulative effects of the Tenmile-South Helena project could be abated if the identified cultural resources are protected through treatment unit redesign, avoidance or mitigation measures. With the implementation of design features, there are no anticipated cumulative effects under alternative 2.

Alternative 3

Direct/Indirect Effects

Under alternative 3, new direct effects would likely occur if design features and mitigation measures are not followed. Direct effects to cultural resources are those that physically alter, damage, or destroy all or part of a resource; alter characteristics of the surrounding environment that contribute to the resource's significance; introduce visual or audible elements out of character with the property or that alters its setting; or resource neglect to the extent that it deteriorates or is destroyed (USDA Forest Service 2005: III-411). The proposed action of alternative 2 and 3 have the potential to directly affect the cultural resources within the proposed project area. Several potential impacts to cultural resources were identified including: thinning projects, and burn treatments. Felled trees can also damage or destroy features and historic structures. Burn treatments have the potential to adversely affect cultural resources by burning historic structures and damaging or destroying artifacts and features within archaeological sites.

Indirect effects under the current proposal are related primarily to reducing the risk of wildfires in the project area. Adverse effects to cultural resources tend to be greater in

wildfire situations because of high temperatures, an inability to control the effects, and because resource inventories cannot be conducted in advance (USDA Forest Service 2005: III-413). In addition, wildfires cause erosion through vegetation-cover loss, resulting in resource deterioration. Vegetation-cover loss may also inadvertently lead to increases in vandalism and looting of cultural sites. The high temperatures of wildfires cause rapid surface weathering of features and artifacts, accelerating loss.

Under alternative 3 a total of 930 acres (23 units) have been reviewed under the NHPA Section 106 process. However, only 2 units have received full inventory coverage. The remaining 21 units have received 2 percent to 95 percent inventory coverage. A total of 19,655 acres (198 units) still need some level of Section 106 review before implementation of this project. Of these, 4,465 acres (60 units) are proposed for mechanical timber harvest and 2,270 acres are proposed for private land buffer. A total of 12,906 acres (95 units) are proposed for prescribed fire and will receive 30 percent inventory per our Stratified Inventory Strategy.

Currently, 43 units under this alternative will need resource protection measure for known sites, see Appendix B of the Fisheries Report for draft resource protection measure recommendations. Additional units could be added as Section 106 inventories are completed and more sites are recorded.

In order to be in compliance with NHPA Section 106 and to complete the effects analysis for cultural resources as described in 36 CFR 800, additional inventories are needed. Table 246 provides a summary of APE acres for alternative 3, which will need additional cultural resource inventories. However, for the purposes of NEPA, the extensive literature search, consultation and sample inventories provide enough information to establish the likely presence of cultural resources for this alternative. If treatment units are designed to avoid cultural resources or resource protection measures are agreed upon, then alternative 3 would have little potential to directly affect cultural resources, provided that project activities are confined to the proposed treatment acres, haul routes and landings.

Irreversible/Irretrievable Commitments

Same as alternative 2

Cumulative Effects

Same as alternative 2

Conclusions

The Tennile-South Helena project area contains a variety of cultural resources. Overall, the project would have a beneficial effect on cultural resources. Under alternative 1, no new direct effects would occur. Alternative 1 would not increase protection of cultural resources since no new inventories would be conducted or new cultural resources would be recorded. Cultural resources would continue to be vulnerable to the effects of fuel loading within the project area, increasing the risk of wildfire.

Both alternatives 2 and 3 could have positive effects to heritage resources including an opportunity for the Forest to monitor eligible cultural resources, discover new cultural resources, a reduction in fuel loading, and the management of control lines to reduce the risk of wildfire effects. These actions all help in protecting the cultural resources and to achieve our desired conditions on the Helena National Forest.

Sample inventories, which began in 2015, have indicated that every 78 acres a new cultural site is being recorded. If this trend continues, we could expect to record 165 new cultural sites as a result of this project. For all proposed alternatives, there are no known cultural resources present that cannot be avoided or mitigated under provisions agreed upon between by the Forest Service and consulting parties. Some areas of the APE have already been inventoried for cultural resources. Future inventories are planned prior to ground disturbance in areas where previous inventory coverage is inadequate. This phased approach to the proposed project is in compliance with NHPA Section 106 regulations and the guidance outlined for the substitution approach by the Council on Environmental Quality and the Advisory Council on Historic Preservation. If additional sites are identified in the proposed APE, consultation with SHPO, Tribes and other identified consulting parties, will determine whether they are historically significant. The Final Record of Decision will address how affects to significant cultural resources will be avoided, minimized or mitigated.

Table 246. Cultural resource inventory requirements, based on alternative

Section 106 Inventories Needed	Alternative 1: No Action	Alternative 2	Alternative 3
Miles of proposed roads to be Inventoried	0	Approximately 45 miles (includes New Construction Routes and portions of Haul Routes)	Approximately 25 miles (includes New Construction Routes and portions of Haul Routes)
Approximate Mechanical Acres to Inventory before Implementation	0	Approximately 6,472 acres to cover in phases, over 2 or 4 years. (Plus monitoring/flagging known sites for avoidance).	Approximately 4,465 acres to cover in phases, over 2 or 4 years. (Plus monitoring/flagging known sites for avoidance).
Approximate Prescribed Fire Acres to Inventory before Implementation	0	Approximately 334 acres to cover in phases, over 1 or 2 years. (Plus monitoring/flagging known sites for avoidance).	Approximately 328 acres to cover in phases, over 1 or 2 years. (Plus monitoring/flagging known sites for avoidance).
Approximate Post-Burn Acres to Inventory to compile with the Stratified Inventory Strategy	0	Approximately 3,006 acres to cover in phases, over 4 or 5 years. (Plus monitoring/flagging known sites for avoidance).	Approximately 2,956 acres to cover in phases, over 4 or 5 years. (Plus monitoring/flagging known sites for avoidance).
Approximate Private Land Buffer Acres to Inventory before Implementation	0	Approximately 2,191 acres to cover in phase, over 2 or 5 years. (Plus monitoring/flagging known sites for avoidance).	Approximately 2,270 acres to cover in phases, over 2 or 5 years. (Plus monitoring/flagging known sites for avoidance).
Total Acres (+ miles)	0	12,831 (+ 45 miles)	10,020 (+ 25 miles)
Miles of proposed roads to be Inventoried	0	Approximately 45 miles (includes New Construction Routes and portions of Haul Routes)	Approximately 25 miles (includes New Construction Routes and portions of Haul Routes)
Approximate Mechanical Acres to Inventory before Implementation	0	Approximately 6,472 acres to cover in phases, over 2 or 4 years. (Plus monitoring/flagging known sites for avoidance).	Approximately 4,465 acres to cover in phases, over 2 or 4 years. (Plus monitoring/flagging known sites for avoidance).
Approximate Prescribed Fire Acres to Inventory before Implementation	0	Approximately 334 acres to cover in phases, over 1 or 2 years. (Plus monitoring/flagging known sites for avoidance).	Approximately 328 acres to cover in phases, over 1 or 2 years. (Plus monitoring/flagging known sites for avoidance).
Approximate Post-Burn Acres to Inventory to compile with the Stratified Inventory Strategy	0	Approximately 3,006 acres to cover in phases, over 4 or 5 years. (Plus monitoring/flagging known sites for avoidance).	Approximately 2,956 acres to cover in phases, over 4 or 5 years. (Plus monitoring/flagging known sites for avoidance).
Approximate Private Land Buffer Acres to Inventory before Implementation	0	Approximately 2,191 acres to cover in phase, over 2 or 5 years. (Plus monitoring/flagging known sites for avoidance).	Approximately 2,270 acres to cover in phases, over 2 or 5 years. (Plus monitoring/flagging known sites for avoidance).

Forest Plan Consistency

The Forest Plan requires the integration of cultural resources in project planning and forest management. Compliance inventory, evaluation of site significance and project

effect, consultation with the Montana State Historic Preservation Office and Tribal Historic Preservation Officers, and implementation of design features for project-affected cultural resources would comply with the National Historic Preservation Act and its implementing regulations in 36 CFR 800, as well as Helena National Forest Plan (USDA 1986) standards and guidelines. Therefore, the results of this project on cultural resources will remain within Forest Plan standards because NHPA Section 106 will be completed prior to implementation and mitigation will be done to avoid adversely affecting cultural resources within the planning area.

Economics

Introduction

The management of the natural resources on the Helena-Lewis and Clark National Forest (HLCNF) has the potential to affect local economies. People and economies are an important part of the ecosystem. Use of resources and recreational visits to the National Forests generate employment and income in the surrounding communities and counties, and generate revenues returned to the Federal Treasury or used to fund additional on-the-ground activities to accomplish resource management objectives.

This report delineates the affected area, assesses potential environmental justice impacts, and outlines methods and results of analyzing the economic effects of the Telegraph Vegetation Management Project, including the project feasibility, financial efficiency, and economic impacts. Project feasibility and financial efficiency relate to the costs and revenues of doing the action. Economic impacts relate to how the action affects the local economy in the surrounding area.

Economics, Affected Environment

The Tenmile – South Helena Project is located on the Helena Ranger District of the Helena National Forest and is located in Lewis and Clark and Jefferson County, Montana. RY Timber, INC in Broadwater County and Sun Mountain Lumber in Powell County are likely destinations for the majority of the sawlog material resulting from this project. Marks and Miller Post and Pole located in Jefferson County is the likely destination of the roundwood material from the project. Lewis and Clark County will likely see positive economic impacts from the project including fuel purchase, equipment repair and hotel visits. Since these are the four counties that would be most affected by the project in terms of social and economic effects, the Affected Environment section focuses on these counties.

The combination of small towns and rural settings, along with people from a wide variety of backgrounds, provides a diverse social environment for the geographical region around the HLCNF, including the Helena Ranger District. Local residents pursue a wide variety of life-styles but many share a common theme—an orientation to the outdoors and natural resources. This is reflected in both vocational and recreational pursuits including employment in outfitter and guide businesses, hiking, hunting, fishing, camping, and many other recreational activities.

Timber, tourism, and agricultural industries are important to the economy of local areas. Despite the common concern for, and dependence on, natural resources within the local communities, social attitudes vary widely with respect to their management. Local residents hold a broad spectrum of perspectives and preferences ranging from complete preservation to maximum development and utilization of natural resources.

Socioeconomic measures used to describe the affected environment were obtained from the Headwater Economics' Economic Profile System – Human Dimensions Toolkit (EPS-HDT 2015), which compiles and summarizes primary population and economic data from a variety of government sources into a report. Key measures used in this report include land ownership, population, employment and income.

Land Ownership

The vast majority of the land area encompassed by the four-county, 5.4 million acre, impact area is managed by various public agencies. The Forest Service manages 42.5 percent of the area. Three of the four counties, Jefferson, Lewis & Clark and Powell counties contain a similar amount of Forest Service land averaging about 45 percent. Broadwater County contains the least amount of Forest Service Land at 24 percent while Lewis and Clark County at 46 percent had the highest. By comparison, only 28 percent of the land area of the United States is federal public land, with only 8.4 percent of that owned by the Forest Service (Figure 121).

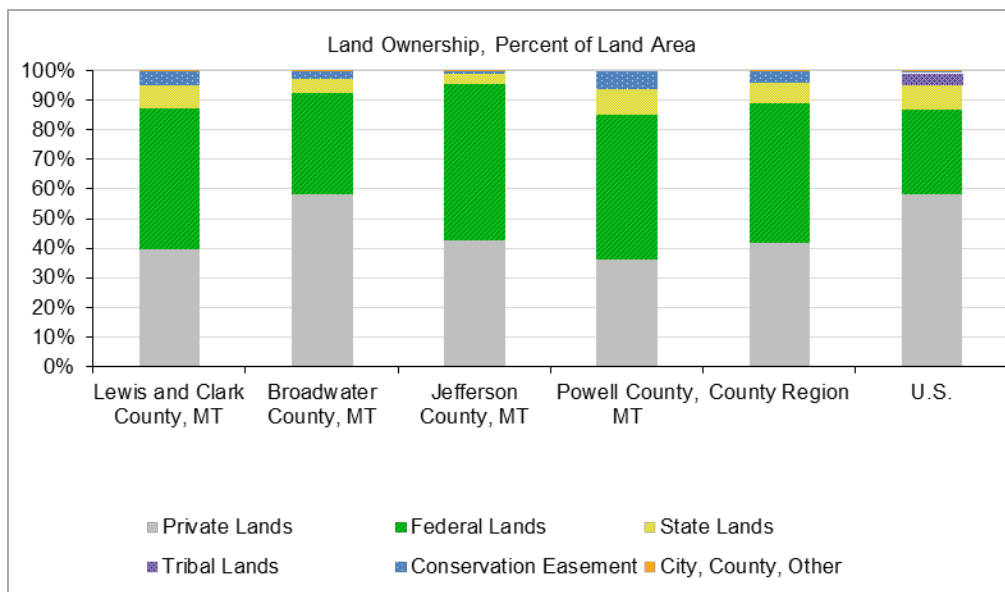


Figure 121. Land ownership, by percent of land area

Table 247. Racial Composition of 2013 population

	Lewis and Clark County, MT	Broadwater County, MT	Jefferson County, MT	Powell County, MT	County Region	U.S.
Total Population	64,143	5,666	11,434	7,052	88,295	311,536,594
White alone	60,047	5,387	10,894	6,517	82,845	230,592,579
Black or African American alone	275	27	43	29	374	39,167,010
American Indian alone	1,820	19	106	295	2,240	2,540,309
Asian alone	342	35	54	43	474	15,231,962
Native Hawaiian & Other Pacific Is. alone	34	0	0	21	55	526,347
Some other race alone	233	2	42	32	309	14,746,054
Two or more races	1,392	196	295	115	1,998	8,732,333
Percent of Total						
White alone	93.6%	95.1%	95.3%	92.4%	93.8%	74.0%
Black or African American alone	0.4%	0.5%	0.4%	0.4%	0.4%	12.6%
American Indian alone	2.8%	0.3%	0.9%	4.2%	2.5%	0.8%
Asian alone	0.5%	0.6%	0.5%	0.6%	0.5%	4.9%
Native Hawaiian & Other Pacific Is. alone	0.1%	0.0%	0.0%	0.3%	0.1%	0.2%
Some other race alone	0.4%	0.0%	0.4%	0.5%	0.3%	4.7%
Two or more races	2.2%	3.5%	2.6%	1.6%	2.3%	2.8%
* The data in this table are calculated by ACS using annual surveys conducted during 2009-2013 and are representative of average characteristics during this period.						

Methodology

The economic measures used for this report are project feasibility, financial efficiency, economic impacts, and environmental justice. These measures, including methodologies, are described below.

Project Feasibility

Project feasibility is used to determine if a project is feasible, that is, will it sell, given current market conditions. The determination of feasibility relies on a residual value (stumpage = revenues - costs) feasibility analysis that uses local delivered log prices and stump to mill costs to determine if a project is feasible. The appraised stumpage rate from this analysis is compared to the base rate (revenues considered essential to cover regeneration plus minimum return to the Federal treasury). The project is considered to be feasible if the appraised stumpage rate exceeds the base rates. If the feasibility analysis indicates that the project is not feasible, the project may need to be modified. A project that is not feasible indicates an increased risk that the project may not attract bids and may not be implemented.

Financial Efficiency

Financial efficiency provides information relevant to the future financial position of the program if the project is implemented. Financial efficiency considers anticipated costs and revenues that are part of Forest Service monetary transactions. Present net value (PNV) is used as an indicator of financial efficiency and presents one tool to be used in conjunction with many other factors in the decision-making process. PNV combines benefits and costs that occur at different times and discounts them into an amount that is equivalent to all economic activity in a single year. A positive PNV indicates that the alternative, including all activities is financially efficient.

Financial efficiency analysis is not intended to be a comprehensive analysis that incorporates monetary expressions of all known market and nonmarket benefits and costs. Many of the values associated with natural resource management are best handled apart from, but in conjunction with, a more limited financial efficiency framework. These nonmarket benefits and costs associated with the project are discussed throughout the various resource sections of this document.

Costs for restoration activities are based on recent experienced costs and professional estimates. Activity costs not related to the timber sale are included in the PNV analysis, but they are not included in appraised timber value. Two PNV's are calculated, one that includes all costs associated with each alternative and one which includes only those costs that are necessary to facilitate the removal of timber.

Economic Impacts (Jobs and Labor Income)

Economic impacts are used to evaluate potential direct, indirect, and cumulative effects on the economy. Economic impacts are estimated using input-output analysis. Input-output analysis is a means of examining relationships within an economy, both between businesses and between businesses and final consumers. It captures all monetary market transactions for consumption in a given time period. The resulting mathematical representation allows one to examine the effect of a change in one or several economic activities on an entire economy, all else constant. This examination is called impact analysis.

The economic impact effects are measured by estimating the direct jobs and labor income generated by (1) the processing of the timber volume from the project, and (2) Forest Service expenditures for contracted restoration activities included as part of the proposed treatments. The direct employment and labor income benefits employees and their families and, therefore, directly affects the local economy. Additional indirect and induced multiplier effects (ripple effects) are generated by the direct activities. Indirect effects are felt by the producers of materials used by the directly affected industries. Induced effects occur when employees of the directly and indirectly affected industries spend the wages they receive. Together the direct and multiplier effects comprise the total economic impacts to the local economy.

Environmental Justice

As stated in Executive Order 12898, it is required that all federal actions consider the potential of disproportionate effects on minority and low-income populations in the local

region. The principals of environmental justice require agencies to address the equity and fairness implications associated with federal land management actions. The Council on Environmental Quality (CEQ) (1997) provides the following definitions in order to provide guidance with the compliance of environmental justice requirements:

“Minority population: Minority populations should be identified where either: (a) the minority population of the affected area exceeds 50 percent or (b) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis...”

“Low-income population: Low-income populations in an affected area should be identified with the annual statistical poverty thresholds from the Bureau of the Census' Current Population Reports, Series P-60 on Income and Poverty. In identifying low-income populations, agencies may consider as a community either a group of individuals living in geographic proximity to one another, or a set of individuals (such as migrant workers or Native Americans), where either type of group experiences common conditions of environmental exposure or effect.”

Spatial and Temporal Context for Effects Analysis

The analysis area for the efficiency analysis is the project area. The Tenmile – South Helena Project area is approximately 60,354 acres in size and is located south and west of the town of Helena in west-central Montana. The Tenmile – South Helena Project area is located in Lewis & Clark and Jefferson Counties. The temporal scope of the analysis is the duration of the proposed activities. The project is expected to be accomplished over a 10-year period with the harvest activity occurring primarily in the first 5 years.

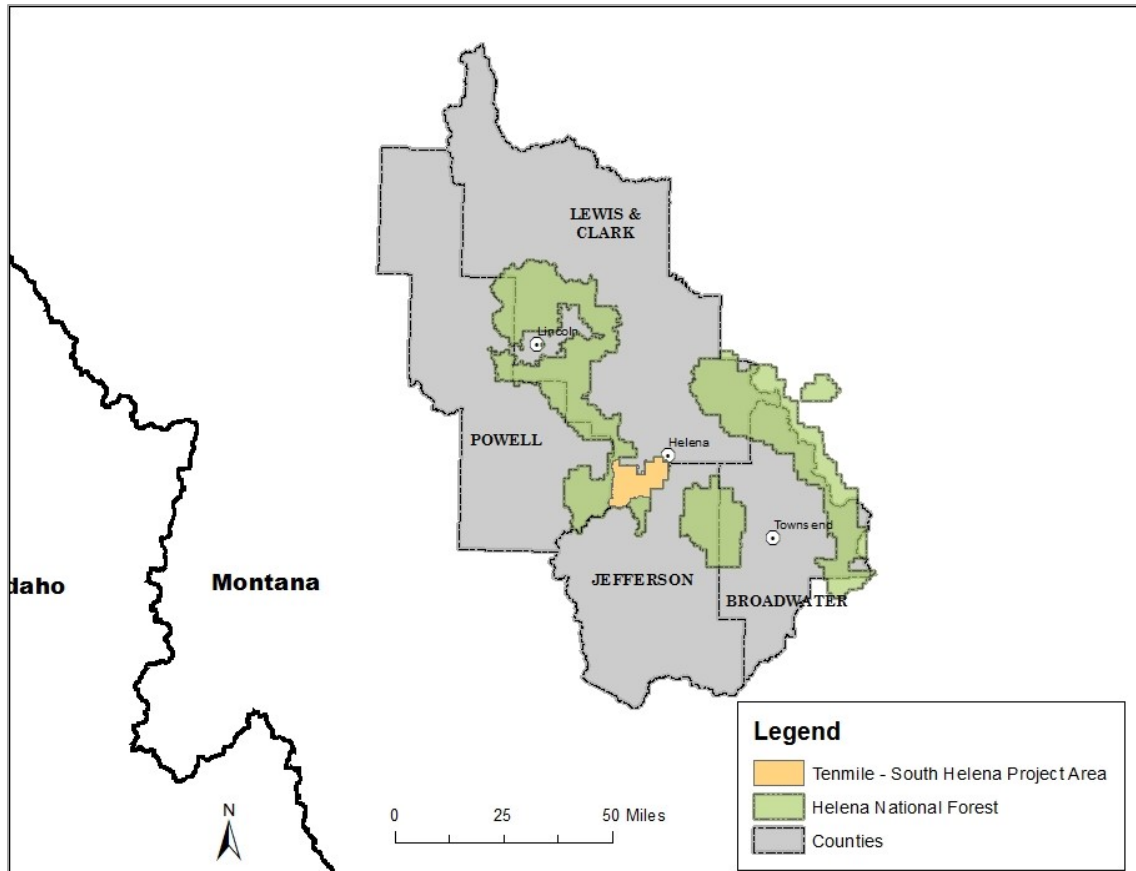


Figure 122. Economic impact area

Economics, Environmental Consequences

Alternative 1 – No Action

The no-action alternative would not harvest timber, implement BMPs on haul routes, return fire to the landscape or implement any of the proposed activities, and therefore, incurs no financial costs. Alternative 1 would produce no revenue and have no effects on jobs or income. It would also fail to meet the Helena National Forest Plan for management area T, which emphasizes timber production while protecting other resources.

Alternatives 2 and 3

Project Feasibility

The estimation of project feasibility was based on the Region 1 Sale Feasibility Model, which is a residual value timber appraisal approach. This method takes into account logging system, timber species and quality, volume removed per acre, lumber market trends, costs for slash treatment, and the cost of specified roads, temporary roads and road maintenance and results in an accurate timber appraisal and is referred to as stumpage. The appraised stumpage rate from the feasibility analysis is compared to base rates (revenues considered essential to cover regeneration plus minimum return to the federal treasury), which in this case is the minimum rate of \$3.00/CCF (hundreds of cubic

feet). The appraised stumpage rate and base rates for each alternative are displayed in Table 237. For each of the action alternatives, the appraised stumpage rate is greater than the base rate, indicating that each of the alternatives is feasible (highly likely to sell).

Financial Efficiency

The financial efficiency analysis is specific to the timber harvest and restoration activities associated with the alternatives (as directed in Forest Service Manual 2400-Timber Management and guidance found in the Forest Service Handbook 2409.18). All costs, timing, and amounts were developed by the specialists on the project's interdisciplinary team. If exact costs were not known, the maximum of the cost range was used to produce the most conservative PNV result. The expected revenue for each alternative is the corresponding predicted high bid from the sale feasibility analysis. The predicted high bid is used for the expected revenue (rather than the appraised stumpage rate) since the predicted high bid is the best estimate of the high bid resulting from the timber sale auction. The PNV was calculated using a 4 percent real discount rate over the 10-year project lifespan (2018-2027). For more information on the values or costs, see the project file.

This analysis is not intended to be a comprehensive benefit-cost or PNV analysis that incorporates a monetary expression of all known market and nonmarket benefits and costs that are generally used when economic efficiency is the sole or primary criterion upon which a decision is made. Many of the values associated with natural resource management are best handled apart from, but in conjunction with, a more limited benefit-cost framework. An example of this is the difficulty in capturing the benefits in monetary terms of prescribed fire on wildlife habitat. These benefits are discussed qualitatively throughout the EIS document, within each resource section.

summarizes the project feasibility and financial efficiency, including the base rates, appraised stumpage rate, predicted high bid, total revenue, and PNV for each alternative. Because all costs of the project are not related to the timber sale, two PNVs were calculated. One PNV indicates the financial efficiency of the timber sale, including all costs and revenues associated with the timber harvest and required design criteria. The required design criteria, as used here, include cost allowances for purchaser required work such as road maintenance and purchaser deposits to fund Forest Service work such as brush disposal. The second PNV includes all costs for each action alternative, including activities that could be funded by the Forest Service, KV or potential Stewardship revenues. For a more detailed view of costs assumption, see the Economics project file.

Table 248 summarizes the project feasibility and financial efficiency, including the base rates, appraised stumpage rate, predicted high bid, total revenue, and PNV for each alternative. Because all costs of the project are not related to the timber sale, two PNVs were calculated. One PNV indicates the financial efficiency of the timber sale, including all costs and revenues associated with the timber harvest and required design criteria. The required design criteria, as used here, include cost allowances for purchaser required work such as road maintenance and purchaser deposits to fund Forest Service work such as brush disposal. The second PNV includes all costs for each action alternative, including activities that could be funded by the Forest Service, KV or potential Stewardship revenues. For a more detailed view of costs assumption, see the Economics project file.

Table 248. Project Feasibility and Financial Efficiency (2015 dollars)

Category	Measure	Alternative 1	Alternative 2	Alternative 3
Timber Harvest Information	Acres Harvested	0	6,076	3,832
	Volume Harvested (CCF)	0	67,823	38,500
	Base Rates (\$/CCF)	0	3.00	3.93
	Appraised Stumpage Rate (\$/CCF)	0	12.29	15.92
	Predicted High Bid (\$/CCF)	0	17.94	21.57
	Total Revenue	0	1,112,877	776,420
Timber Harvest & Required Design Criteria	PNV	0	878,796	628,791
Timber Harvest & All Other Planned Non-timber Activities	PNV	0	(37,242,237)	(56,246,136)

Conclusions

Both action alternatives predict similar appraised stumpage rates and predicted high bid regarding the sale of timber associated with implementation of this project.

Estimates of timber value are based on current fair market values of timber. Even though timber markets have fluctuated in the past and current markets have not returned to their pre-2008 levels; Forest Service timber sales have continued to sell during these challenging markets.

A major factor that influences the value of the timber particularly in the Tenmile – South Helena Project area is the quality of the dead lodgepole pine (LP). A significant percentage of the volume in this project comes from dead LP. The mortality is a result of the mountain pine beetle outbreak that began in 2008. Following mortality LP retains its value as a sawlog product for a time. As the tree begins to deteriorate that value as a sawlog diminishes, however the tree may still be viable for other less valuable products.

Table 248 displays project feasibility and financial efficiency indicates that both action alternatives are financially inefficient (negative PNV) when including all activities associated with the analysis. Table 248 also indicates that both action alternatives are feasible when considering only timber harvest and the required design criteria. The no-action alternative has no costs or revenues associated with it.

A reduction of financial PNV in any alternative as compared to the most efficient solution is a component of the economic trade-off, or opportunity cost, of achieving that alternative. The no-action alternative would not harvest timber or take other restorative actions and, therefore, incur no costs. As indicated earlier, many of the values associated with natural resource management are nonmarket benefits. These benefits should be considered in conjunction with the financial efficiency information presented here. These nonmarket values are discussed in the various resource sections found in this document.

When evaluating trade-offs, the use of efficiency measures is one tool used by the decision maker in making the decision. Many things cannot be quantified, such as effects on wildlife and the restoration of watersheds and vegetation. The decision maker takes many factors into account in making the decision.

Economic Impact Effects

The analysis calculated the jobs and labor income associated with the processing of the timber products harvested, and all other activities in this proposal, such as prescribed fire, noncommercial fuel reduction, and pre-commercial thinning. Timber products harvested and the non-timber activities would have direct, indirect, and induced effects on local jobs and labor income. Only the expenditures associated with the contracted activities are included in the impact

Table 249 displays the direct, indirect and induced, and total estimates for employment (part and full-time) and labor income that may be attributed to each alternative. Since the expenditures occur over time, the estimated impacts of jobs and labor income would be spread out over the life of the project. It is important to note that these may not be new jobs or income, but rather jobs and income that are supported by this project. These impacts are shown both in total (over the life of the project) and on an annual basis. It is anticipated that the timber harvest would occur over a 4-year period and restoration activities are projected to occur over a 10-year period.

Table 249. Employment and labor income by alternative

Timber Harvest						
	Alternative 1		Alternative 2		Alternative 3	
Part and Full Time Jobs Contributed	Total	Annual	Total	Annual	Total	Annual
Direct	0	0	178	36	101	25
Indirect and Induced	0	0	32	6	18	5
Total	0	0	210	42	119	30
Labor Income Contributed (\$M2010)						
Direct	0	0	\$7437	\$1487	\$4222	\$1055
Indirect and Induced	0	0	\$1125	\$225	\$639	\$160
Total	0	0	\$8562	\$1712	\$4860	\$1215
Restoration Activities						
	Alternative 1		Alternative 2		Alternative 3	
Part and Full Time Jobs Contributed	Total	Annual	Total	Annual	Total	Annual
Direct	0	0	267	27	59	6
Indirect and Induced	0	0	29	3	7	1
Total	0	0	296	30	65	7
Labor Income Contributed (\$M2010)						
Direct	0	0	\$7,143	\$714	\$1,576	\$158
Indirect and Induced	0	0	\$716	\$72	\$168	\$17
Total	0	0	7,859	\$786	\$1,744	\$174
All Activities						
Part and Full Time Jobs Contributed			Total	Annual	Total	Annual
Direct			445	62	160	31
Indirect and Induced			61	9	25	5
Total			506	72	185	36
Labor Income Contributed (\$M2010)						
Direct			\$14,581	\$2,202	\$5,798	\$1,213
Indirect and Induced			\$1,841	\$297	\$806	\$176
Total			\$16,421	\$2,498	\$6,604	\$1,390

Conclusions

Alternative 2 would result in 506 jobs, 321 more total jobs than alternative 3, and more labor income at \$16.4 million over the life of the project. The annual effects for alternative 2 would be more since this alternative has more timber harvest. If the harvest

takes longer than anticipated, the total impacts would remain the same, but the annual contributions would be reduced. Approximately 210 direct, indirect and induced jobs and \$8.6 million of labor income would be associated with the timber harvest activities, with the rest associated with restoration activities.

Alternative 3 would contribute approximately 185 jobs and \$6.6 million in total labor income over the life of the project. On an annual basis, this would amount to approximately 36 jobs per year over a period of 10 years, and \$1.4 million annually in total labor income. Approximately 119 direct, indirect and induced jobs and \$4.9 million of labor income would be associated with the timber harvest activities, with the rest associated with restoration activities.

The no-action alternative maintains no jobs or income because there are no proposed project activities associated with this alternative.

Environmental Justice

According to the CEQ's Environmental Justice Guidelines for NEPA (1997), "minority populations should be identified where either: (a) the minority population of the affected area exceeds 50 percent or (b) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis." Table 247 shows that the total share of all minority populations represented less than 10 percent of the population in the state and the analysis area in 2013. Thus, the U.S. Census data suggest minority populations within the analysis area do not meet the CEQ's Environmental Justice criterion.

CEQ guidance on identifying low-income populations states that "...agencies may consider as a community either a group of individuals living in geographic proximity to one another, or a set of individuals (e.g., migrant workers or Native Americans), where either type of group experiences common conditions of environmental exposure or effect." Low-income populations are defined, based on the 2014 Census standard, as persons living below the poverty level (based on total income of \$24,008 for a family household of four). Persistent poverty status requires a county to have experienced an individual poverty rate in excess of 20 percent for several Census years. The average percentage of the population living below the poverty line in the affected area between 2009 and 2013 for Broadwater County is 10.5 percent, 15.3 percent of the population in Powell County, 7.8 percent of the population in Jefferson County and 10.4 percent of the population in Lewis & Clark County. Based on this data, the characteristic of persistent poverty is not present in the analysis area.

Table 249 predicts more employment and labor income opportunities would be created by alternatives 2 than 3. Implementation of any of the action alternatives would not likely adversely affect minority or low-income populations. Implementation of the no-action alternative maintains the status quo and provides no additional employment or income in the economic impact area.

The Executive Order also directs agencies to consider patterns of subsistence hunting and fishing when an action proposed by an agency has the potential to affect fish or wildlife. There are no Native American Reservations or designated Native American hunting

grounds located in or near the analysis area. None of the alternatives restrict or alter opportunities for subsistence hunting and fishing by Native American tribes. Tribes holding treaty rights for hunting and fishing on the Helena National Forest are included on the project mailing list and have the opportunity to provide comments on this project.

Other Required Disclosures

NEPA at 40 CFR 1502.25(a) directs “to the fullest extent possible, agencies shall prepare draft environmental impact statements concurrently with and integrated with ...other environmental review laws and executive orders.”

Short-term Uses and Long-term Productivity

NEPA requires consideration of “the relationship between short-term uses of man’s environment and the maintenance and enhancement of long-term productivity” (40 CFR 1502.16). As declared by the Congress, this includes using all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans (NEPA Section 101).

Short-term uses, and their effects, are those that occur within the first few years of project implementation. Long-term productivity refers to the capability of the land and resources to continue producing goods and services long after the project has been implemented. Under the Multiple-Use Sustained-Yield Act and the National Forest Management Act, all renewable resources are to be managed in such a way that they are available for future generations. The harvesting and use of standing timber can be considered a short-term use of a renewable resource. As a renewable resource, trees can be reestablished and grown again if the long-term productivity of the land is maintained. This long-term productivity is maintained through the application of the project design features described in chapter 2, in particular those applying to the soil and water resources.

Under alternatives 2 and 3, openings would be created in units throughout the project area in the short term, but more resilient forested stands would be established for the long term. The action alternatives would improve the heterogeneity across the project by creating patches and patterns that, to some extent, emulate natural fire which has been excluded from this ecosystem for a century. Vegetation growth and succession are dynamic processes and can be reflected by affecting changes in fire behavior over time. The restoration of fire adapted ecosystems does not involve simply the maintenance of open, late seral stands, but also increasing large-scale heterogeneity by promoting a mosaic of conditions on the landscape on all forest types, including the upper elevations. Proposed treatments would promote resilience to disturbances such as wildfire by creating a mosaic of conditions in densities, species composition, and age class.

Unavoidable Adverse Effects

Implementation of any action alternative could cause some adverse environmental effects that cannot be effectively mitigated or avoided. Unavoidable adverse effects often result from managing the land for one resource at the expense of the use or condition of other

resources. Some adverse effects are short term and necessary to achieve long-term beneficial effects. Many adverse effects can be reduced, mitigated, or avoided by limiting the extent or duration of effects. The interdisciplinary procedure used to identify specific treatment units and temporary roads was designed to eliminate or lessen the significant adverse consequences to resource protection standards of the Helena National Forest Plan. The application of project design features was intended to further limit the extent, severity, and duration of potential effects. Such measures have been discussed throughout this DEIS.

CHAPTER 4. CONSULTATION AND COORDINATION

Preparers and Contributors

The Forest Service consulted the following individuals, Federal, State, and local agencies, tribes and other organization and individuals during the development of this environmental impact statement:

Interdisciplinary Team Members

The following individuals comprised the interdisciplinary team.

Table 250. Tenmile – South Helena interdisciplinary team members

Name	Role	Education	Years Experience
Allen Byrd	Team Leader, NEPA Planner	Bachelors of Science in Forestry: Resource Conservation Masters of Arts in Geography: Community and Environmental Planning	19 Years
Amanda Hendrix	Botany	Bachelors of Science in Plant Science	12 years
Arian Randall	Heritage and Cultural Resources	Bachelor of Science in Anthropology Masters of Science in Cultural Resource Management	8 Years
Brent Costain	Wildlife	Masters of Science in Wildlife Biology	25 Years
Brett Beagley	Air Quality	Technical Fire Management	18 Years
Cara Farr	Soils	Bachelors of Science in Soil Science: Masters of Science in Soil Science	11 Years
Casey Johnson	Noxious Weeds	Bachelors of Science in Forestry: Range Resources Management	11 years
Dave Callery	Project Proponent/Hydrology	Masters of Science in Water Resources	14 Years
David Fothergill	Recreation / Scenery	Masters in Landscape Architecture	4 Years
David Nunn	Project Proponent/Fire & Fuels	Bachelor of Science in Forestry	18 Years
Denise Penderoth	Wildlife	Masters of Science in Wildlife Biology	28 Years
Fred Godfrey	Writer/Editor	Bachelors of Science in Earth Science: Physical Geography Masters of Arts in Liberal Arts Masters of Military Arts and Science	25 Years
George Liknes	Aquatic Species (Fisheries)	Bachelors of Science in Fish and Wildlife Management Masters of Science in Fish and Wildlife Management	34 Years

Name	Role	Education	Years Experience
Heather Degeest	Helena District Ranger	Bachelors of Science Degree's in Land Resource Analysis and Management and Forest Resource Management	14 Years
Jonathan LeBlanc	Soils	Bachelors of Science in Biology: Wetlands Biology/Ecology Masters of Science in Soil Science	5 Years
Jonathan Olsen	Fires and Fuels	Bachelors of Science in Forestry	15 Years
Laura Conway	Wildlife	Bachelors of Science in Fisheries and Wildlife Biology	27 Years
Marshall Thompson	Partnership Coordinator / Collaborative Liaison	Fire Management	17 Years
Mary Ellen Emerick	Roadless Expanse / IRA	Bachelors of Science in English with coursework in Biological Sciences	21 Years
Mary Smith	Transportation	Bachelors of Science in Civil Engineering	5 Years
Megan Dawson	Range	Bachelors of Science in Rangeland Management	11 Years
Michael O'Brien	BLM Liaison (Cooperating Agency)	Bachelors of Science in Forest Operations	5 Years
Robert Gump	Silviculture	Bachelors of Science in Forest Management	30 Years
Roy Barkley	Recreation	Bachelors of Science in Industrial Technology	28 Years
Sean Hill	Wildlife	Bachelors of Science in Fisheries and Wildlife Conservation	11 Years
Shanna Kleinsmith	Writer/Editor	Bachelors of Science in Natural Resource Ecology	14 Years
Sharon Scott	Project Proponent	Bachelors of Science in Forestry	25 Years
Tom Stivers	Wildlife	Bachelors of Science in Wildlife Biology Masters of Science in Wildlife Biology	35 Years

Federal Agencies

Bureau of Land Management

U.S. Fish and Wildlife Service

U.S. Environmental Protection Agency

Honorable Ryan Zinke, U.S. House of Representatives

Honorable Steve Daines, U.S. Senate

Honorable Jon Tester, Missoula, MT.

State Government

Montana Fish, Wildlife, and Parks

Montana Department of Natural Resources and Conservation

Montana Department of Environmental Quality

Local Government

Powell County, Montana Commissioners

Lewis and Clark County, Montana Commissioners

Jefferson County, Montana Commissioners

City of Helena, Montana

Federally Recognized Tribes

Blackfeet Tribal Business Council, Browning, MT

Chippewa Cree Tribe, Box Elder, MT

Confederated Salish/Kootenai Tribal Council, Pablo, MT

Crow Tribal Historic Preservation Office, Crow Agency, MT

Little Shell Tribe of Chippewa Indians of Montana, Black Eagle, MT

Nez Perce Tribal Historic Preservation Officer/Cultural Resource Program, Lapwai, ID

Northern Cheyenne Tribal Historic Preservation Council, Lame Deer, MT

Tribal Historic Preservation Officer Blackfeet, Browning, MT

Others

City of Helena Tennmile Watershed Collaborative Committee

City of Helena Tennmile - South Helena Forest Restoration Collaborative Committee

Tri –County FireSafe Working Group, Montana

Baxendale Fire Department, Montana

City of Helena, Fire Council South Helena, Montana

Distribution of the Environmental Impact Statement

This environmental impact statement has been distributed to individuals who specifically requested a copy of the document. In addition, copies or notification of the DEIS's availability have been sent to the following Federal agencies, federally recognized tribes, State and local governments, organizations, and individuals representing a wide range of views.

Federal Agencies

Director, Planning and Review, Advisory Council on Historic Preservation, Washington, DC

U.S. Department of Agriculture, APHIS PPD/EAD, Riverdale, MD

National Environmental Coordinator, NRCS, Washington, DC

USDA Office of Civil Rights, Washington, DC

U.S. National Agricultural Library, Acquisitions and Serial Branch, Beltsville, MD

NOAA Office of Policy and Strategic Planning

U.S. Chief of Naval Operations, Energy and Environmental Readiness Division, Washington, DC

U.S. Coast Guard, Washington, DC

U.S. Army Corps of Engineers, Northwestern Division, Portland, OR

U.S. Environmental Protection Agency, Washington, DC

U.S. Environmental Protection Agency, Region 8, Denver, CO

DOE, NEPA Policy and Compliance, Washington, DC

Director OEPC, Washington, DC

Director Northeast Power Planning Council, Portland, OR

Federal Aviation Administration, Renton, WA

Federal Highway Administration, Helena, MT

Federally Recognized Tribes

Badger-Two Medicine Committee, Browning, MT

Blackfeet Tribal Business Council, Browning, MT

Chippewa Cree Tribe, Box Elder, MT

Confederated Salish/Kootenai Tribal Council, Pablo, MT

Crow Tribal Historic Preservation Office, Crow Agency, MT

Eastern Shoshone Historic Preservation Office, Fort Washakie, WY

Fort Belknap, Harlem, MT

Little Shell Tribe, Great Falls, MT

Little Shell Tribe of Chippewa Indians of Montana, Black Eagle, MT

Metis, Choteau, MT

Nez Perce Tribal Historic Preservation Officer/Cultural Resource Program, Lapwai, ID

Northern Arapahoe Business Council, Fort Washakie, WY

Northern Cheyenne Tribal Historic Preservation Council, Lame Deer, MT

Shoshone-Bannock Tribes, Fort Hall, ID

Tribal Historic Preservation Officer Blackfeet, Browning, MT

State and Local Governments

Department of Environmental Quality, Helena MT

Montana Fish, Wildlife, and Parks, Helena, MT

Montana Fish, Wildlife, and Parks, Missoula, MT

Montana Fish, Wildlife, and Parks, Bozeman, MT

Water Quality Planning Board, Helena, MT

Lewis & Clark County Library, Helena, MT

Lewis & Clark County, Office of Prevention and Mitigation, Helena, MT

Powell County Commissioner, Elliston, MT

Lewis and Clark County Commissioner, Helena, MT

Jefferson County Commissioner, Boulder, MT

Honorable Steve Daines, Helena MT

Honorable Jon Tester, Missoula MT

Honorable Ryan Zinke, Helena, MT

Organizations

Alliance for the Wild Rockies (AWR), Helena, MT

Capital Trail Vehicle Association, Helena, MT

Clancy-Unionville Citizens' Task Force, Clancy, MT

City of Helena, Montana

City of Helena Tenmile - South Helena Forest Restoration Collaborative Committee

Continental Divide Trail Society, Baltimore, MD

Helena Hunters & Anglers, Helena MT

Montana Wilderness Association, Helena, MT

Montana Ecosystems Defense Council, Inc. Bozeman, MT

Native Ecosystems Council (NEC), Willow Creek, MT

People Who Care, Montana

Rocky Mountain Elk Foundation, Townsend, MT

Western Watersheds Project, Missoula, MT

Individuals

Aber, Jesse, MT

Alarcon, Cynthia

Alexander, Bob, Helena, MT

Alles, Ron, MT

Anderson, Dave, Helena, MT

Artley, Dick, Grangeville, ID

Balazs, Janelle and Stephen, MT

Bik, Patricia, Helena, MT

Bishop, Mike, Helena, MT

Bishop, Don, Helena, MT

Booker, Doug, Helena, MT

Brown, Ray, Helena, MT

Bucher, Bill, Helena, MT

Burgoyne, Ron, Helena, MT

Cannon, Mike, Helena, MT

Cady, Cassie, Helena, MT

Chamberlin, Wayne, Helena, MT

Church, Robert and Donna, Helena, MT

Clarke, Nick, Helena, MT

Clausen, Bill, Helena, MT

Cogley, Dave, Clancy, MT

Cohenow, Joe, East Helena, MT

Coleman, Merrilee, Helena, MT

Cowden, Lester and Debbie, Helena, MT

Deveny, Christine, Helena, MT

Donnelly, Katherine

Donohoe, Joseph, Helena, MT

Dorrington, Jeff and Phillis, Helena, MT

Dunfee, Patricia, Helena, MT

Edens, Dan, Helena, MT

Elkins, Sarah, Helena, MT

Evans, Bill, Helena, MT

Fitzgerald, Diane, Helena, MT

Kuenzli, Doug, Helena, MT

Kuntz, Gail, Helena, MT

Lallum, Lyle, Helena, MT

Langsather, Brad, Helena, MT

Laster, Steve, Clancy, MT

Lee, Karole, Clancy, MT

Fleury, Ben, Helena, MT

Flowers, Pat, Bozeman, MT

Frantz, Bob, Helena, MT

Garrity, Mike, Helena, MT

Gatchell, John, MT

Gauthier, Terry

George, John, Helena, MT

Gradin, Cindy, Helena, MT

Grayum, Gretchen, Helena, MT

Hall, Pat and Gary, Helena, MT

Hallinan, Bill, Helena, MT

Hannon, John, Helena, MT

Hanson, Joann, Helena, MT

Harp, Duane, Helena, MT

Hash, Julie, Daniel, and Colton, Helena, MT

Heidman, Diane, Helena, MT

Henrikson, Craig

Herberger, Jason

Hudson, Hank and Karen, Clancy, MT

Johnson, Mark, MT

Johnson, Otto, East Helena, MT

Johnson, Sara, Helena, MT

Johnson, Patrick, Helena, MT

Jorgensen, Rich, Helena, MT

Joslin, Gayle, Helena, MT

Juisto, Chere, Helena, MT

Karper, Philip, Helena, MT

Keim, Linda, Helena, MT

Kelly, Steve, Bozeman, MT

Kent, Paul and Vicki, Helena, MT

Kiser, Chris, Helena, MT

Koehler, Larry, Helena, MT

Kron, Darrin, Helena, MT

Prendergast, John, Helena, MT

Prill, Ray and Jan, Helena, MT

Public, Jean

Putnam, Stan, Helena, MT

Reilly, Thomas, Helena, MT

Richards, Hoyt, Helena, MT

Lelaheun, Liz, Helena, MT
Lloyd, Kathy, Helena, MT
Lorengo, Brian, Anaconda, MT
MacLean, Vicky, Helena, MT
Mainwaring, Scott, Helena, MT
Marks, Gary, Helena, MT
McBroam, Jennifer, Helena, MT
McDaniel, Terry, Helena, MT
McEvoy, Stephen, Helena, MT
McEvoy, Carol, Montana City, MT
McKelvey, Pat, Helena, MT
Merwin, Spenser, Missoula, MT
Morgan, Joe, Helena, MT
Mullarkey, Jim and Marie, Helena, MT
Mullen, Norm, Helena, MT
Nelson, Summer, Missoula, MT
Nichel, Steve, Helena, MT
Nimick, David and Angie, Helena, MT
O'Neill, Deb, Clancy, MT
Parrott, Kim
Periman, George, Helena, MT
Pickett, Leonard, Helena, MT
Platt, Amelia, Denver, CO
Platt, Steve, Helena, MT
Poeitti, Liz, Helena, MT
Posewitz, James, Helena, MT
Powell, Doug, Helena, MT

Rice, Vicki, Helena, MT
Robbins, Jim, Helena, MT
Roberts, Eric, Helena, MT
Salo, Ken and Eileen, Helena, MT
Schramm, LeRoy, Helena, MT
Schroth, Bill, Helena, MT
Shevalier, Jack and Pat
Shipley, Rob, Helena, MT
Sloan, Dick, Helena, MT
Smith, Stephan and Susan
Smith, William P., Helena, MT
Stafford, Laura, Kelly, and Mark, Helena, MT
Steele, Beth, Helena, MT
Strong, Jerry, Helena, MT
Swecker, Shirley, Bozeman, MT
Swierc, James, Helena, MT
Tangen, Will, East Helena, MT
Tapper, Doug and Mary, Helena, MT
Thweatt, Dick, Helena, MT
Tipton, Diane, Helena, MT
Tuber, Rick, Helena, MT
Ullrey, Jeff and Phillis, Helena, MT
Wallace, Ken and Stephanie, Helena, MT
Westphal, Scott, Townsend, MT
Wheeler, Wendy, Helena, MT
Wilson, Mark, Helena, MT
Wolf, James, Baltimore, MD

GLOSSARY

A

Anthropogenic emissions: Emissions produced as a result of human activity, including emissions from agricultural activity and domestic livestock.

Appropriate Management Response (AMR): Any specific action suitable to meet fire management objectives. The response action is based on an evaluation of risks to firefighter and public safety, the circumstances under which the fire occurs, including weather and fuel conditions, natural and cultural resource management objectives, protection priorities, and values to be protected.

Aspect: The cardinal direction in which a slope faces.

B

Background: Area located four miles to the horizon from the observer.

Big Game: Those species of large mammals normally managed as a sport hunting resource.

Biological Assessment: An evaluation conducted on Federal projects requiring an environmental impact statement, in accordance with the Endangered Species Act. The purpose of the assessment is to determine whether the proposed action is likely to affect an endangered, threatened, or proposed species.

Biological Evaluation: An evaluation conducted on Forest Service projects in accordance with Forest Service policy. The purpose is to determine whether any of the project alternatives are likely to affect threatened, endangered, or sensitive species.

C

Canopy: The more or less continuous cover of branches and foliage formed collectively by the crowns of adjacent trees and other woody growth. Layers of canopy may be called stories.

Canopy Base Height: For modeling in BehavePlus, canopy base height refers to understory ladder fuels and the main canopy layer for a stand of trees.

Canopy Bulk Density: Mass of available canopy fuel per unit canopy volume of a stand.

Canopy Closure: The proportion of the sky hemisphere obscured by vegetation when viewed from a single point.

Canopy Cover: Canopy cover is defined as the proportion of the forest floor covered by the vertical projection of tree crowns.

Cavity: The hollow, excavated in snags by birds; used for roosting and reproduction by many birds and mammals.

Chains/Hr: chains per hour (1 chain per 66 feet).

Characteristic Landscape: The naturally established landscape within a scene or scenes being viewed.

Closed Canopy: The condition that exists when the canopy created by trees or shrubs or both is dense enough to exclude most of the direct sunlight from the forest floor.

Closure: Restriction of motor vehicle use on a travelway by means of elimination or prohibition. Closures may be permanent or temporary depending on management objectives.

Coarse Filter: The coarse filter desired condition is to maintain a diversity of habitats for a full range of wildlife species while meeting other resource desired conditions and ecological processes which alter or maintain habitat structure and function. The coarse filter objective is to retain representative habitats and seral stages and, therefore, the population viability for the majority of species within the diversity of habitats that the Big Belt Mountains provide.

Coarse Woody Debris: Downed trees and large branches that provide habitat for a variety of species. For fire and fuels it is defined as dead wood greater than three inches in diameter or 1000-hour time lag fuels.

Connectivity: This refers to the abundance and spatial patterning of habitat and to the ability of members of a population to move from patch to patch of similar habitat.

Corridor: A narrow strip, stepping stones, or a series of stepping stones of hospitable territory traversing inhospitable territory providing access one area to another

Cover: Vegetation used by wildlife for protection from predators, breeding and rearing of young (hiding cover), or to ameliorate conditions of weather (thermal cover).

Cover/Forage Ratio: The ratio, in percent, of the amount of area providing cover as compared to that providing forage.

Critical Surface Flame Length: Surface fire flame length associated with critical surface intensity as needed to transition to a crown fire.

Crown Fire: A fire that spreads in the canopy of trees or shrubs more or less independent of a surface fire; is a moderate to high-intensity fire with nearly complete overstory mortality creating large patch sizes with an intermediate amount of edge (Agee 1998; Arno et al. 2000). Active crown fire often requires surface fuels that burn above a critical intensity and flame length, moderate to high canopy bulk density with continuous crown fuels, and average to below average foliar moisture content (Van Wagner 1977). Crown fire initiation is a complex phenomenon due to multiple interacting factors: topography, relative humidity, fuel moisture, and atmospheric stability, and surface fire intensity, length of the fire front, frontal passages, and vegetation structure including the presence of

ladder fuels (Rothermel 1991). Cessation of a crown fire run is often linked to a significant change in weather such as decreased wind speed or increased relative humidity (Rothermel 1991).

D

Decadent: Deteriorating; when used in reference to stand condition there are inferences of the loss of trees from the overstory and of the presence of disease, or indications of loss of vigor in dominant trees so that the mean annual increment is negative.

Decommissioning: Activities that result in the stabilization and restoration of unneeded roads or trails to a more natural state.

Degree of alteration: The magnitude of alteration from the characteristic environment or how unnatural it would look.

Denning Site: A place of shelter for an animal; also where an animal gives birth and raises young.

Designated Road, Trail, or Area: A National Forest System road, a National Forest System trail, or an area on National Forest System lands that is designated for motor vehicle use pursuant to 36 CFR 212.51 on a motor vehicle use map.

Direct Attack: any treatment of burning fuel, such as by wetting, smothering, or chemically quenching the fire or by physically separating burning from unburned fuel.

Distance Zones: Landscape areas denoted by specified distances from the observer. Distance zones are used as frame of reference in which to discuss landscape attributes or the scenic effect of human activities in a landscape.

Diversity: The relative distribution and abundance of different plant and animal communities and species within an area.

Dominant: Plant species or species groups which, by means of their numbers, coverage, or size, influence or control the existence of associated species. Also, individual animals which determine the behavior of one or more other animals, resulting in the establishment of a social hierarchy.

E

Ecosystem: An interacting natural system including all the component organisms together with the abiotic environment.

Ecotone: The overlap or transition zone between two plant communities.

Edge: An edge is the juxtaposition of contrasting environments in an ecosystem. This term is commonly used in conjunction with the boundary between natural habitats, especially forests, and disturbed or developed land.

Elk Herd Unit: The total area used by a herd of elk in the course of one year's movement from summer to winter range. This includes areas outside the National Forest boundary.

Elk Security Areas: Elk security is defined as a proportion of an elk herd unit within the administrative boundary of the Helena Ranger District that consists of an area of at least 1000 acres in size that is at least ½ mile from a motorized route open to the public between September 1st and December 1st.

Endangered Species: Any plant or animal species which is in danger of extinction throughout all or a significant portion of its range. (Endangered Species Act of 1973).

Environment: The aggregate of physical, biological, economic, and social factors affecting organisms in an area.

F

Fine Woody Debris: Dead wood less than three inches in diameter or 1-, 10-, and 100-hour timelag fuels.

Fire Behavior: Intrinsically tied to vegetation. In general, dry forests dominated by ponderosa pine and Douglas-fir can variably burn as a surface fire or mixed-severity with potential patches of high-severity fire (Baker et al. 2007). Cold forests commonly include intermixed subalpine fir (*Abies lasiocarpa*), whitebark pine (*Pinus albicaulis*), and lodgepole pine (*Pinus contorta*) and are typified by the entire fire behavior spectrum. Moist forests on the HLCNF are not equivalent to the moist forests of Oregon, Washington, northern Idaho, and northwestern Montana that are influenced by a maritime climate. Moist forests in the Divide Landscape include Douglas-fir/lodgepole pine, lodgepole pine, Douglas-fir/shade-tolerant mixed conifer types, and the lower elevations of the subalpine zone represented mostly by subalpine fir and Engelmann spruce (*Picea engelmannii*). Fire frequency is defined as the average number of years between fires or the mean fire interval (Baker and Ehle, 2001; Hann and Bunnell, 2001)

Fire Behavior Fuel Model (FBFM): A cohesive set of parameters that define the necessary inputs to the fire spread model.

Fireline Intensity: Fireline intensity is the heat energy release per unit time from a one-foot (one-meter) wide section of the fuel bed extending from the front to the rear of the flaming zone. Fireline intensity is a function of rate of spread and heat per unit area, and is directly related to flame length.

Fire Regime Groups (FRG): Were intended to characterize the presumed historical fire regimes within landscapes based on interactions between vegetation dynamics, fire spread, fire effects, and spatial context.

Fire Severity: The magnitude of significant negative fire impacts on wildland systems.

Fire Type: Surface (S), torching (T, [passive crown fire]), or crowning (C, [active crown fire]).

Flaming Combustion Phase: Luminous oxidation of gases evolved from the rapid decomposition of fuel. This phase follows the pre-ignition phase and precedes the smoldering combustion phase, which has a much slower combustion rate. Water vapor, soot, and tar comprise the visible smoke. Relatively efficient combustion produces minimal soot and tar, resulting in white smoke; high moisture content also produces white smoke.

Flame Length: The distance between the tip of the flame and the midpoint of the flame depth at the base of the flame (generally the ground surface) and serve as an indicator of fire intensity. Torching, or passive crown fire, is the specified fire type output from BEHAVEPLUS that best represents the mixed-severity fire category and often occurs with low canopy base height and sparse crown having low canopy bulk density (Van Wagner 1977).

Foliar Moisture: Moisture content of overstory foliage; one of the attributes used to determine transition from surface to crown fire; 100 percent refers to mature foliage with new growth complete.

Forage: Vegetation used for food by wildlife, particularly big game wildlife and domestic livestock

Forbs: Herbaceous flowering plants that are not graminoids (grasses, sedges, and rushes).

Foreground: The detailed landscape found within 0 to ¼ to ½ mile from the observer.

Forest Road or Trail: A road or trail wholly or partly within or adjacent to and serving the National Forest System that the Forest Service determines is necessary for the protection, administration, and utilization of the National Forest System and the use and development of its resources.

Forest Transportation Atlas: A display of the system of roads, trails, and airfields of an administrative unit.

Forest Transportation System: The system of National Forest System roads, National Forest System trails, and airfields on National Forest System lands.

Fragmentation: A change in landscape structure that leads to smaller patch sizes, less interior habitat, and greater distances between patches which in turn can lead to subpopulation isolation. It is generally attributed to human activity rather than to natural disturbances.

Fuel Profile: Surface, ladder, and crown (aerial) fuel. Fuels are characterized by their size, moisture content, flammability, and location. The size of the fuel determines how quickly it ignites (its flammability) and how long and how intensity it burns. Larger pieces of wood require greater heat to ignite but, once ignited, can continue to burn for a long time. Smaller pieces ignite readily but burn quickly. Moisture content of fuel is influenced by whether the fuel is live or dead plants,

the season of year, and recent weather. Dry fuels ignite more easily and burn hotter. All elements of the fuel profile should be considered when managing fire hazard (Nunamaker 2007).

Fugitive Dust: Dust particles that are introduced into the air through certain activities such as soil cultivation, or vehicles operating on open fields or dirt roadways.

G

Glowing Combustion Phase: The final phase of combustion following flaming and smoldering phases. The process of oxidation of solid fuel accompanied by incandescence. All volatiles have already been driven off, oxygen reaches the combustion surfaces, and there is no visible smoke. This phase follows the smoldering combustion phase and continues until the temperature drops below the combustion threshold value, or until only non-combustible ash remains.

H

Habitat: The sum total of environmental conditions of a specific place occupied by a wildlife species or a population of such species.

Habitat Component: A simple part, or a relatively complex entity regarded as a part, or an area or type of environment in which an organism or biological population normally lives or occurs.

Habitat Effectiveness: The degree to which a patch of habitat is able to support an animal or group of animals. Habitat effectiveness in an otherwise good patch of habitat can be reduced by high levels of human disturbance, long distances to other habitat patches or any other factors in the surrounding landscape that detract from the patch's ability to function as habitat.

Heat per Unit Area: Heat per unit area is the heat energy release per area (HPUA; square foot or square meter) within the flaming front of the surface fuel. Heat per unit area is not affected by wind, slope, or direction of spread. HPUA is calculated in Rothermel's (1972) surface fire spread model and is based on only the fine fuels that affect fire spread.

Hiding Cover: Vegetation capable of hiding 90 percent of a standing adult deer or elk from the view of a human at a distance equal to or less than 200 feet, and having a minimum size of 40 acres or a stand of coniferous trees having a crown closure of greater than 40 percent.

HLCNF: Helena – Lewis and Clark National Forest. The Helena and Lewis and Clark National Forests administratively consolidated December 11, 2015. The combined forest will continue to operate under their respective forest plans until a new plan is completed.

HNF: Helena National Forest.

I

Immigration: The behavior of individuals or populations of animals moving into an area to settle there.

Indirect Attack: A method of suppression in which the control line is located some considerable distance away from the fire's active edge. Generally done in the case of a fast-spreading or high-intensity fire and to utilize natural or constructed firebreaks fuel breaks and favorable breaks in the topography. The intervening fuel is usually backfired; but occasionally the main fire is allowed to burn to the line, depending on conditions.

Intermittent Refuge Area: Intermittent refuge areas are those areas at least 250 acres in size and less than 1000 acres in size that are greater than or equal to ½ mile from a motorized route open to the public between September 1st and December 1st.

J

Juxtaposition: To place, or compare, side by side.

L

Ladder Fuels: Fuels that provide vertical continuity between surface and canopy fuels; an example would be conifer seedlings and saplings.

Landscape: The aspect of the land that is characteristic of a particular region or area.

Landscape Character: A combination of physical, biological, and, cultural images that give an area its visual and cultural identity and helps define a "sense of place". Landscape character provides a frame of reference from which to determine scenic attractiveness and to measure scenic integrity.

Landscape Visibility: Visual accessibility of the landscape to viewers, referring to one's ability to see and perceive landscapes and to the relative importance and sensitivity of what is seen and perceived in the landscape. Concern levels and distance zones are elements of landscape visibility.

Lynx Analysis Unit (LAU): The LAU is a project analysis unit upon which direct, indirect, and cumulative effects analyses are performed. An LAU is an area of at least the size used by an individual lynx, from about 25 to 50 square miles (LCAS). An LAU is a unit for which the effects of a project would be analyzed; its boundaries should remain constant.

Lynx Habitat: Lynx habitat occurs in mesic coniferous forest that experience cold, snowy winters and provide a prey base of snowshoe hare. In the northern Rockies, lynx habitat is generally occurs between 3,500 and 8,000 feet of elevation, and primarily consists of lodgepole pine, subalpine fir and Engelmann spruce. It may consist of cedar-hemlock in extreme northern Idaho, northeastern Washington and northwestern Montana, or of Douglas-fir on moist sites at higher elevations in central Idaho. It may also consist of cool, moist Douglas-fir, grand fir, western larch and aspen when interspersed in subalpine forests. Dry forests do not provide lynx habitat.

M

Maximum Modification: Activities may dominate the characteristic landscape in the foreground and middle-ground; however, when viewed as background, the visual characteristics must be those of natural occurrences.

Maintenance: The upkeep of the entire forest transportation facility including surface and shoulders, parking and side areas, structures, and such traffic-control devices as are necessary for its safe and efficient utilization.

Maintenance Levels: Defines the level of service provided by, and maintenance required for, a specific road, consistent with road management objectives and maintenance criteria.

LEVEL 1. These are roads that have been placed in storage between intermittent uses. The period of storage must exceed one year. Basic custodial maintenance is performed to prevent damage to adjacent resources and to perpetuate the road for future resource management needs. Emphasis is normally given to maintaining drainage facilities and runoff patterns. Planned road deterioration may occur at this level. Appropriate traffic management strategies are "prohibit" and "eliminate" all traffic. These roads are not shown on motor vehicle use maps. Roads receiving level 1 maintenance may be of any type, class, or construction standard, and may be managed at any other maintenance level during the time they are open for traffic. However, while being maintained at level 1, they are closed to vehicular traffic but may be available and suitable for non-motorized uses.

LEVEL 2. Assigned to roads open for use by high clearance vehicles. Passenger car traffic, user comfort, and user convenience are not considerations. Warning signs and traffic control devices are not provided with the exception that some signing, such as W-18-1 "No Traffic Signs," may be posted at intersections. Motorists should have no expectations of being alerted to potential hazards while driving these roads. Traffic is normally minor, usually consisting of one or a combination of administrative, permitted, dispersed recreation, or other specialized uses. Log haul may occur at this level. Appropriate traffic management strategies are either to:

- a. Discourage or prohibit passenger cars, or
- b. Accept or discourage high clearance vehicles.

LEVEL 3. Assigned to roads open and maintained for travel by a prudent driver in a standard passenger car. User comfort and convenience are not considered priorities. The Manual on Uniform Traffic Control Devices (MUTCD) are applicable. Warning signs and traffic control devices are provided to alert motorists of situations that may violate expectations.

Roads in this maintenance level are typically low speed with single lanes and turnouts. Appropriate traffic management strategies are either "encourage" or "accept." "Discourage" or "prohibit" strategies may be employed for certain classes of vehicles or users.

LEVEL 4. Assigned to roads that provide a moderate degree of user comfort and convenience at moderate travel speeds. Most roads are double lane and aggregate surfaced. However, some roads may be single lane. Some roads may be paved and/or dust abated. Manual on Uniform Traffic Control Devices is applicable. The most appropriate traffic management strategy is "encourage." However, the "prohibit" strategy may apply to specific classes of vehicles or users at certain times.

LEVEL 5. Assigned to roads that provide a high degree of user comfort and convenience. These roads are normally double lane, paved facilities. Some may be aggregate surfaced and dust abated. Manual on Uniform Traffic Control Devices is applicable. The appropriate traffic management strategy is "encourage."

Mean Fire Interval: Mean of all fire intervals in a given area for a specified period of time.

Metapopulation: A group of populations, usually of the same species, which exist at the same time but in different places.

µg/m³: Micrograms per Cubic Meter of Air

Mid-flame Windspeed: The windspeed at mid-flame height above the fuel bed; also referred to as eye-level winds.

Mixing Heights: The height to which the lower atmosphere will undergo mechanical or turbulent mixing, producing a nearly homogenous air mass.

Modification: Activities of vegetative and landform alteration must borrow from naturally established line, form, color, and texture so that their visual characteristics are those of natural occurrences within the surrounding area when viewed as middle ground or background. Activities may visually dominate the original characteristic landscape.

Motor Vehicle: Any vehicle which is self-propelled, other than: (1) A vehicle operated on rails; and (2) Any wheelchair or mobility device, including one that is battery-powered, that is designed solely for use by a mobility-impaired person for locomotion, and that is suitable for use in an indoor pedestrian area.

Mule Deer Reproductive Habitat: Areas with resources required for recovery of physical condition and successful reproduction by deer.

N

National Forest System Road: A forest road other than a road which has been authorized by a legally documented right-of-way held by a State, county, or other local public road authority.

O

Objective Maintenance Level: The maintenance level to be assigned at a future date considering future road management objectives, traffic needs, budget constraints, and environmental concerns. The objective maintenance level may be the same as, or higher or lower than, the operational maintenance level. The transition from operational maintenance level to objective maintenance level may depend on reconstruction or disinvestment.

Old Growth: Old growth is a distinct successional stage in the development of a timber stand that has special significance for wildlife, generally characterized by: (1) large diameter trees (often exceeding 19 inches diameter-at-breast-height) with a relatively dense, often multilayer canopy. (2) the presence of large, standing dead or dying trees. (3) down and dead trees, (4) stand decadence associated with the presence of various fungi and heartrots, (5) and an average age often in excess of 200 years.

Open Road: A motorized route that is open to the public.

Open Road Density: Generally used relative to a standard set in the Forest Plan that is applied to most Management Areas important to big game. Also used to address overall effects of open roads on wildlife.

Operational Maintenance Level: The maintenance level currently assigned to a road considering today's needs, road condition, budget constraints, and environmental concerns. It defines the level to which the road is currently being maintained.

Overstory: The portion of trees in a forest which forms the uppermost layer of foliage.

P

Partial Retention: Activities may repeat form, line, color, or texture which are found infrequently or not at all in the characteristic landscape, but remain visually subordinate to the visual strength of the characteristic landscape.

Passive Crown Fire: See torching.

Patch: A unit of measure for determining effects to wildlife connectivity. A patch is an area that is greater than ½ mile from an open road regardless of size of area.

R

Realignment: Activity that results in a new location of an existing road or portions of an existing road and treatment of the old roadway.

Reconstruction (road or trail): Improvement and/or realignment of a travelway.

Refugia: Large, contiguous areas encompassing the full array of seasonal habitats and are relatively secure from human development.

Residence Time: For this analysis residence time considers all phases of a fire starting from the flaming combustion phase through the glowing combustion phase.

Retention: The visual quality objective provides for management activities which are not visually evident. Activities may only repeat form, line, color, and texture which are frequently found in the characteristic landscape.

Richness: Species richness is the number of different species in a given area.

Riparian: Area with distinctive soil and vegetation between a stream or other body of water and the adjacent upland; includes wetlands and those portions of floodplains and valley bottoms that support riparian vegetation.

Road: A motor vehicle route over 50 inches wide, unless identified and managed as a trail.

Road Obliteration: A type of road decommissioning in which the road prism is re-contoured; cut and fill slopes are restored to natural grades; and slash, stumps, and woody debris is placed on top of the corridor to effectively block vehicle travel.

S

Scenery Management: The art and science of planning and designing landscape attributes relative to the appearance of places and expanses in outdoor settings. Scenery management involves administering the use of National Forest System lands within the context of multiple-use ecosystem management to ensure high quality scenery for the overall well-being and psychological welfare of society and future generations.

Scorch Height: Height above the ground that the temperature in the convection column reaches the lethal temperature to kill live crown foliage.

Seen Area: An area identified as visible from a particular view point. Most seen areas are generated from the use of ArcMap's viewshed operation. This operation uses a digital elevation model (DEM) that doesn't account for land cover.

Sensitivity Level 1 Travel Corridor: Travel corridors used frequently by the public where quality scenic resources are highly valued.

Sensitive Species (BLM): Species designated by the State Director, usually in cooperation with the State agency responsible for managing the species and State

Natural heritage programs, as sensitive. They are those species that: (1) could become endangered in or extirpated from a State, or within a significant portion of its distribution; (2) are under status review by the FWS and/or NMFS; (3) are undergoing significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution; (4) are under-going significant current or predicted downward trends in population or density such that federal listed, proposed, candidate, or State listed status may become necessary; (5) typically have small and widely dispersed populations; (6) inhabit ecological refugia or other specialized or unique habitats; or (7) are State listed but which may be better conserved through application of BLM sensitive species status.

Sensitive Species (Forest Service): Those species identified by the Regional Forester for which population viability is a concern as evidenced by significant current or predicted downward trends in (a) population numbers or density, or (b) habitat capability that would reduce a species' existing distribution.

Seral Stage: A transitory or developmental stage of a biotic community in an ecological succession (does not include climax successional stage or pioneer stage).

Shrub: A plant with persistent woody stems and relatively low growth form; usually produces several basal shoots as opposed to a single bole; differs from a tree by its low stature and non-arborescent form.

Size Class: coded attribute representing the fire size.

A = 0 – 0.25 acres

B = 0.25 – 9.9 acres

C = 10 – 99.9 acres

D = 100 – 299.9 acres

E = 300 – 999.9 acres

F = 1000 – 4999.9 acres

G = 5000+ acres

Slope: the ratio between the amount of vertical rise of a slope and horizontal distance as expressed in a percent.

Snag: A standing dead tree usually without merchantable value for timber products, but may have characteristics of benefit to some cavity nesting wildlife species.

Species: A unit of classification of plants and animals consisting of the largest and most inclusive array of sexually reproducing and cross-fertilizing individuals which share a common gene pool.

Stand: A community of trees or other vegetation uniform in composition, constitution, spatial arrangement, or condition to be distinguishable from adjacent communities.

Standard: A particular action, level of performance, or threshold specified by the Forest Plan for resource protection or accomplishment of management objectives.

Unlike "guidelines" which are optional, standards specified in the Forest Plan are mandatory.

Storage: Used to describe an intermittent use road during the time it is closed to vehicular use. When referring to a National Forest System road, storage is synonymous with a Maintenance Level 1.

Summer Range: A range, usually at higher elevation, used by deer and elk during the summer; a summer range is usually much more extensive than a winter range.

Surface Fire: A fire that burns close to the ground surface including dead branches, leaves, and low vegetation.

Sustainability: Sustainability means that desired ecological conditions or flows or benefits can be maintained over time (A National Framework Ecosystem Management, USDA Forest Service, Washington, DC, 1994)

T

Temporary Road: A road necessary for emergency operations or authorized by contract, permit, lease, or other written authorization that is not a forest road or a forest trail and that is not included in a forest transportation atlas.

Thermal Cover: Cover used by animals to ameliorate effects of weather; a stand of coniferous trees 40 feet or more tall with an average crown closure of 70 percent or more, and having a minimum size of 15 acres.

Threatened Species: Any species of plant or animal which is likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

Torching: A fire that burns a single tree or group of trees, also known as passive crown fire.

Travel Management Atlas: An atlas that consists of a forest transportation atlas and a motor vehicle use map or maps.

Twenty-Foot Winds: Wind speed and direction at 20 feet above the height of the top of the vegetation.

U

Unauthorized Road or Trail: A road or trail that is not a forest road or trail or a temporary road or trail and that is not included in a forest transportation atlas.

W

Wildlife Diversity: The relative degree of abundance of wildlife species, plant species, communities, habitats or habitat features per unit area.

Wind Adjustment Factor: Adjusts the 20 foot windspeed to midflame windspeed depending on the sheltering of fuels from the wind. 0.1 - fully sheltered, dense stands, 0.2 - fully sheltered, open stands, 0.3 - partially sheltered, 0.4 – unsheltered.

Winter Range: A range, usually at lower elevation, used by migratory deer and elk during the winter months, usually better defined and smaller than summer ranges.

LIST OF ACRONYMS USED THROUGHOUT THIS DEIS

BFO	Butte Field Office
BLM	Bureau of Land Management
CDNST	Continental Divide National Scenic Trail
CDT	Continental Divide Trail
CFR	Code of Federal Regulations
CWA	Clean Water Act
CWPP	Community Wildfire Protection Plan
DEIS	Draft Environmental Impact Statement
EHU	Elk Herd Unit
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FEIS	Final Environmental Impact Statement
FLPMA	Federal Lands Policy and Management Act
FS	Forest Service
FSH	Forest Service Handbook
FSM	Forest Service Manual
HLCNF	Helena – Lewis and Clark National Forests
HNF	Helena National Forest
IDT	Interdisciplinary Team
IRA	Inventoried Roadless Area
MPB	Mountain Pine Beetle
NEPA	National Environmental Policy Act
NFMA	National Forest Management Act
NFS	National Forest Service
RMP	Resource Management Plan
ROD	Record Of Decision
TCFWG	Tri –County FireSafe Working Group
TMDL	Total Maximum Daily Load
TMWCC	Tennmile Watershed Collaborative Committee
TSHFRCC	Tennmile - South Helena Forest Restoration Collaborative Committee
WBP	White Bark Pine
WUI	Wildland Urban Interface

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590, 595, 596, 598, 616, 660, 680,
681, 682, 683, 685, 686, 687, 689,
690, 693, 694, 695, 697, 706, 723,
724, 725, 737, 754, 796, 798, 805,
807, 808, 810, 813
- water quality, 199, 526, 544, 548, 560,
572, 588, 589, 600, 619, 626, 627,
630, 632, 634, 635, 637, 640, 646,
647, 651, 654, 655, 657, 661, 666, 670
- water yield, 54, 626, 628, 630, 632, 638,
639, 640, 644, 645, 647, 649, 650,
651, 653, 657, 669
- wolverine, 194, 197, 207, 218, 419, 439,
440, 441, 442, 443, 444, 445, 446,
447, 448, 449, 450, 451, 452, 453,
454, 455, 507, 515, 521, 524

APPENDIX A: PROPOSED UNIT-BY-UNIT TREATMENT SUMMARY

Table 252 lists the units in the project area under both action alternatives. It includes information and descriptions on the action alternative units are proposed under, acre size, management area, treatment type and method, whether the unit is located within WUI and/or IRA, as well as tree species, size class and canopy cover.

Table 251. Abbreviations found in Table 252

MA	Management Area
BLM	Bureau of Land Management
N	No (referring to not within IRA or WUI)
Y	Yes (referring to within IRA or WUI)
Mech	Mechanical
IRA	Inventoried Roadless Area
LP	Lodgepole Pine
SAF	Subalpine fir
DF	Douglas-fir
G	Grassland
PP	Ponderosa Pine
J	Jericho Mountain IRA
L	Lazyman Gulch IRA
DBH	Diameter at Breast Height

Table 252. Treatment units in the project area

Unit ID	Alternative (2/3)	Alternative Acres	MA/BLM	Wildland Urban Interface	Treatment Type	Treatment Method	IRA (J/L/N)	Dominant Species	Size Class (DBH)	Canopy Cover (%)
1	2	71	H1	N	Regeneration Harvest	Mech, Fire	N	LP	5.0-9.9	60+
2	2	27	H1	N	Precommercial Thin	Hand, Fire	N	SAF	5.0-9.9	60+
	3	27	H1	N	Precommercial Thin	Hand, Fire	N	SAF	5.0-9.9	60+
3	2	78	H1	N	Regeneration Harvest	Mech, Fire	N	LP	5.0-9.9	60+
4	2	25	H1	N	Regeneration Harvest	Mech, Fire	N	LP	0-4.9	60+
	3	25	H1	N	Regeneration Harvest	Mech, Fire	N	LP	0-4.9	60+
5	2	53	H1	N	Regeneration Harvest	Mech, Fire	N	LP	5.0-9.9	60+
	3	53	H1	N	Regeneration Harvest	Mech, Fire	N	LP	5.0-9.9	60+
6	2	29	H1	N	Precommercial Thin	Mech, Fire	N	LP	5.0-9.9	60+
	3	29	H1	N	Precommercial Thin	Mech, Fire	N	LP	5.0-9.9	60+
7a	2	33	H2, T5,T1	Y	Low Severity Prescribed Fire	Hand, Fire	J	DF	10 - 14.9	40-60
7b	2	152	H2, T5,T1	Y	Mixed Severity Prescribed Fire	Mech, Hand, Fire	J	LP	5.0-9.9	60+
7c	2	543	H2, T5,T1	Y	Low Severity Prescribed Fire	Hand, Fire	J	DF/LP/G	5.0-9.9	60+
7d	2	244	H2, T5,T1	Y	Shaded Fuel Break	Mech, Hand, Fire	J	DF/LP	5.0-9.9	60+
7e	2	89	H2, T5,T1	Y	Mixed Severity Prescribed Fire	Mech, Hand, Fire	J	LP	5.0-9.9	60+
8a	2	123	T1, T5, H1, H2, T4	Y	Shaded Fuel Break	Mech, Hand, Fire	J	DF/LP	5.0-9.9	60+
8b	2	69	T1, T5, H1, H2, T4	Y	Mixed Severity Prescribed Fire	Hand, Fire	J	DF/LP	5.0-9.9	60+

Unit ID	Alternative (2/3)	Alternative Acres	MA/BLM	Wildland Urban Interface	Treatment Type	Treatment Method	IRA (J/L/N)	Dominant Species	Size Class (DBH)	Canopy Cover (%)
8c	2	195	T1, T5, H1, H2, T4	Y	Low Severity Prescribed Fire	Hand, Fire	J	DF	10-14.9	60+
8d	2	308	T1, T5, H1, H2, T4	Y	Low Severity Prescribed Fire	Hand, Fire	J	DF/LP	5.0-9.9	60+
8e	3	146	H1, H2	Y	Low Severity Prescribed Fire	Hand, Fire	J	DF/LP	5.0-9.9	60+
8f	2	125	T1, T5, H1, H2, T4	Y	Low Severity Prescribed Fire	Hand, Fire	J	LP	5.0-9.9	60+
8g	2	124	T1, T5, H1, H2, T4	Y	Shaded Fuel Break	Mech, Hand, Fire	J	DF/LP	5.0-9.9	60+
8h	2	150	T1, T5, H1, H2, T4	Y	Mixed Severity Prescribed Fire	Hand, Fire	J	DF/LP	10-14.9	40-60
8i	2	122	T1, T5, H1, H2, T4	Y	Low Severity Prescribed Fire	Hand, Fire	J	DF/LP	10-14.9	40-60
8j	2	167	T1, T5, H1, H2, T4	Y	Mixed Severity Prescribed Fire	Hand, Fire	J	DF/LP	5.0-9.9	60+
8k	2	82	T1, T5, H1, H2, T4	Y	Shaded Fuel Break	Mech, Hand, Fire	J	DF	10--14.9	60+
8l	2	151	T1, T5, H1, H2, T4	Y	Mixed Severity Prescribed Fire	Hand, Fire	J	DF/LP	5.0-9.9	60+
8m	2	147	T1, T5, H1, H2, T4	Y	Low Severity Prescribed Fire	Hand, Fire	J	DF/LP	10-14.9	60+
8n	2	95	T1, T5, H1, H2, T4	Y	Shaded Fuel Break	Mech, Hand, Fire	J	DF/LP	10-14.9	60+
8o	2	324	T1, T5, H1, H2, T4	Y	Mixed Severity Prescribed Fire	Hand, Fire	J	DF	10-14.9	60+
8p	2	289	T1, T5, H1, H2, T4	Y	Low Severity Prescribed Fire	Hand, Fire	J	DF	10-14.9	60+
8q	2	187	T1, T5, H1, H2, T4	Y	Shaded Fuel Break	Mech, Hand, Fire	J	DF/LP	10-14.9	60+
8r	3	502	T1, T5, H1, H2, T4	Y	Shaded Fuel Break	Hand, Fire	J	DF/LP/G	5.0-9.9	60+
8s	3	155	T1, T5	Y	Mixed Severity Prescribed Fire	Hand, Fire	J	DF/LP	5.0-9.9	60+
8t	3	133	T1, T5	Y	Low Severity Prescribed Fire	Hand, Fire	J	DF	10.0-14.9	60+

Unit ID	Alternative (2/3)	Alternative Acres	MA/BLM	Wildland Urban Interface	Treatment Type	Treatment Method	IRA (J/L/N)	Dominant Species	Size Class (DBH)	Canopy Cover (%)
8u	3	159	T1, H1	Y	Mixed Severity Prescribed Fire	Hand, Fire	J	DF/LP	5.0-9.9	40-60
9a	2	129	L1, T1	y	Low Severity Prescribed Fire	Hand, Fire	N	DF	10-14.9	40-60
	3	129	L1, T1	Y	Low Severity Prescribed Fire	Hand, Fire	N	DF	10-14.9	40-60
9b	2	29	T1	y	Low Severity Prescribed Fire	Hand, Fire	N	DF	10-14.9	40-60
	3	29	T1	Y	Low Severity Prescribed Fire	Hand, Fire	N	DF	10-14.9	60+
11	2	523	H2, H1	y	Regeneration Harvest	Mech, Fire	N	DF/LP	5.0 - 9.9	60+
	3	523	H2, H1	Y	Regeneration Harvest	Mech, Fire	N	DF/LP	5.0 - 9.9	40-60
14	2	40	H2, H1	N	Regeneration Harvest	Mech, Fire	N	LP	5.0 - 9.9	60+
	3	40	H2, H1	N	Regeneration Harvest	Mech, Fire	N	LP	5.0 - 9.9	60+
15	2	70	H2	N	Regeneration Harvest	Mech, Fire	N	LP	5.0 - 9.9	60+
	3	70	H2	N	Regeneration Harvest	Mech, Fire	N	LP	5.0 - 9.9	60+
16	2	18	H2	N	Regeneration Harvest	Mech, Fire	N	LP	5.0 - 9.9	60+
	3	18	H2	N	Regeneration Harvest	Mech, Fire	N	LP	5.0 - 9.9	60+
17	2	72	H2	N	Regeneration Harvest	Mech, Fire	N	LP	5.0 - 9.9	60+
	3	72	H2	N	Regeneration Harvest	Mech, Fire	N	LP	5.0 - 9.9	60+
18	2	134	H1	Y	Regeneration Harvest	Mech, Fire	N	LP	5.0 - 9.9	60+
19	2	169	H1, H2	Y	Regeneration Harvest	Mech, Fire	N	LP	5.0 - 9.9	60+
	3	169	H1, H2	Y	Regeneration Harvest	Mech, Fire	N	LP	5.0 - 9.9	60+

Unit ID	Alternative (2/3)	Alternative Acres	MA/BLM	Wildland Urban Interface	Treatment Type	Treatment Method	IRA (J/L/N)	Dominant Species	Size Class (DBH)	Canopy Cover (%)
20	2	85	H2	Y	Regeneration Harvest	Mech, Fire	N	LP	10.0-14.9	60+
	3	85	H2	Y	Regeneration Harvest	Mech, Fire	N	LP	10.0-14.9	60+
21	2	101	H1, H2, T1	N	Regeneration Harvest	Mech, Fire	N	LP	5.0 - 9.9	60+
22	2	130	H1	Y	Regeneration Harvest	Mech, Fire	N	LP	5.0 - 9.9	60+
	3	130	H1	Y	Regeneration Harvest	Mech, Fire	N	LP	5.0 - 9.9	60+
23	2	90	H1	Y	Regeneration Harvest	Mech, Fire	N	LP	5.0 - 9.9	60+
	3	90	H1	Y	Regeneration Harvest	Mech, Fire	N	LP	5.0 - 9.9	60+
24	2	78	H1	Y	Regeneration Harvest	Mech, Fire	N	LP	5.0 - 9.9	60+
	3	78	H1	Y	Regeneration Harvest	Mech, Fire	N	LP	5.0 - 9.9	60+
26	2	223	W1, T1	Y	Regeneration Harvest	Mech, Fire	N	LP	5.0 - 9.9	60+
27A	2	42	H1	Y	Regeneration Harvest	Mech, Fire	N	LP	5.0 - 9.9	60+
27B	2	54	H1	Y	Regeneration Harvest	Mech, Fire	N	LP	10.0-14.9	60+
27C	2	27	H1	Y	Regeneration Harvest	Mech, Fire	N	LP	5.0-9.9	60+
28	2	164	H1, T1	Y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	LP	5.0-9.9	60+
29	2	84	H1	Y	Regeneration Harvest	Mech, Fire	N	LP	5.0-9.9	60+
29a	3	40	H1	Y	Regeneration Harvest	Mech, Fire	N	LP	5.0-9.9	60+
29b	3	45	H1	Y	Regeneration Harvest	Mech, Fire	N	LP	5.0-9.9	60+
30	2	92	H1, H2	Y	Regeneration Harvest	Mech, Fire	N	LP	5.0-9.9	60+

Unit ID	Alternative (2/3)	Alternative Acres	MA/BLM	Wildland Urban Interface	Treatment Type	Treatment Method	IRA (J/L/N)	Dominant Species	Size Class (DBH)	Canopy Cover (%)
31	2	14	H2, H1	Y	Regeneration Harvest	Mech, Fire	N	LP	5.0-9.9	60+
32	2	47	H2	Y	Regeneration Harvest	Mech, Fire	N	DF/LP	10.0-14.9	60+
33	2	39	H2	Y	Regeneration Harvest	Mech, Fire	N	LP	5.0-9.9	60+
	3	39	H2	Y	Regeneration Harvest	Mech, Fire	N	LP	5.0-9.9	60+
34	2	36	H2	Y	Precommercial thin	Mech, Fire	N	LP	5.0-9.9	60+
	3	25	H2	Y	Precommercial thin	Mech, Fire	N	LP	5.0-9.9	60+
35	2	53	H2	Y	Regeneration Harvest	Mech, Fire	N	LP	5.0-9.9	60+
	3	42	H2	Y	Regeneration Harvest	Mech, Fire	N	LP	5.0-9.9	60+
36	2	193	H2	Y	Regeneration Harvest	Mech, Fire	N	LP	5.0-9.9	60+
37	2	755	H1, H2	Y	Low Severity Prescribed Fire	Mech, Fire	N	LP	5.0-9.9	60+
	3	229	H1, H2	Y	Low Severity Prescribed Fire	Hand, Fire	N	LP	5.0-9.9	60+
39a	2	16	L2, M1, T3	Y	Low Severity Prescribed Fire	Hand, Fire	L	DF	10.0-14.9	40-60
	3	16	L2, M1, T3	Y	Low Severity Prescribed Fire	Hand, Fire	L	DF	10.0-14.9	40-60
39b	2	85	T3, T4	Y	Improvement Harvest	Mech, Fire	N	DF	10.0-14.9	60+
	3	79	T3, T4	Y	Improvement Harvest	Mech, Fire	N	DF	10.0-14.9	60+
39c	2	43	T3, T4	Y	Regeneration Harvest	Mech, Fire	N	DF/LP	10.0-14.9	60+
	3	43	T3, T4	Y	Regeneration Harvest	Mech, Fire	N	DF/LP	10.0-14.9	60+
39d	2	12	T3	Y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	DF	15.0+	40-60

Unit ID	Alternative (2/3)	Alternative Acres	MA/BLM	Wildland Urban Interface	Treatment Type	Treatment Method	IRA (J/L/N)	Dominant Species	Size Class (DBH)	Canopy Cover (%)
	3	12	T3	Y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	DF	15.0+	40-60
39e	2	17	T3, W1	Y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	DF	10.0-14.9	40-60
	3	17		Y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	DF	10.0-14.9	40-60
39f	2	115	T3, L2, M1	Y	Low Severity Prescribed Fire	Hand, Fire	N	DF	10.0-14.9	40-60
	3	33	T3, L2, M1	Y	Low Severity Prescribed Fire	Hand, Fire	N	DF	10.0-14.9	40-60
39g	2	8	T3, W1	Y	Improvement Harvest	Mech, Fire	N	DF	10.0-14.9	60+
	3	7	T3, W1	Y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	DF	10.0-14.9	60+
39h	2	14	T3	Y	Improvement Harvest	Mech, Fire	N	DF	10.0-14.9	60+
	3	14	T3	Y	Improvement Harvest	Mech, Fire	N	DF	10.0-14.9	60+
39i	2	26	W1, T1	Y	Improvement Harvest	Mech, Fire	N	DF	10.0-14.9	60+
	3	26	W1, T1	Y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	DF	10.0-14.9	60+
39j	2	21	W1, L2	Y	Low Severity Prescribed Fire	Mech, Hand, Fire	L	DF	15.0+	40-60
	3	26	W1, L2	Y	Low Severity Prescribed Fire	Hand, Fire	L	DF	15.0+	40-60
39k	2	29	W1, L2	Y	Low Severity Prescribed Fire	Mech, Hand, Fire	L	DF	10.0-14.9	60+
39l	2	17	L2	Y	Low Severity Prescribed Fire	Hand, Fire	L	DF	10.0-14.9	60+
39m	2	26	L2	Y	Low Severity Prescribed Fire	Hand, Fire	L	DF	10.0-14.9	60+
	3	26	L2	Y	Low Severity Prescribed Fire	Hand, Fire	L	DF	10.0-14.9	60+
39n	2	91	L2	Y	Low Severity Prescribed Fire	Mech, Hand, Fire	L	DF/LP	10.0-14.9	60+

Unit ID	Alternative (2/3)	Alternative Acres	MA/BLM	Wildland Urban Interface	Treatment Type	Treatment Method	IRA (J/L/N)	Dominant Species	Size Class (DBH)	Canopy Cover (%)
	3	91	L2	Y	Low Severity Prescribed Fire	Hand, Fire	L	DF/LP	10.0-14.9	60+
39o	2	24	L2	Y	Low Severity Prescribed Fire	Hand, Fire	L	DF	10.0-14.9	60+
	3	24	L2	Y	Low Severity Prescribed Fire	Hand, Fire	L	DF	10.0-14.9	60+
39p	2	10	L2, M1, T3	Y	Low Severity Prescribed Fire	Hand, Fire	L	DF/G	10.0-14.9	60+
	3	10	L2, M1, T3	Y	Low Severity Prescribed Fire	Hand, Fire	L	DF/G	10.0-14.9	60+
39q	2	288	L2, M1, T3	Y	Low Severity Prescribed Fire	Hand, Fire	L	DF/G	15.0+	40-60
39r	2	17	L2, M1, T3	Y	Low Severity Prescribed Fire	Hand, Fire	L	PP/DF	15.0+	25-40
39s	2	19	T3, W1	Y	Improvement Harvest	Mech, Fire	N	DF	10.0-14.9	60+
	3	12	T3, W1	Y	Improvement Harvest	Mech, Fire	N	DF	10.0-14.9	60+
39t	3	7	T3, W1	Y	Low Severity Prescribed Fire	Hand, Fire	N	DF	10.0-14.9	60+
39u	2	45	L2, M1, T3	Y	Low Severity Prescribed Fire	Hand, Fire	L	DF/G	15.0+	60+
39v	2	57	L2, M1, T3	Y	Low Severity Prescribed Fire	Hand, Fire	L	DF	10.0-14.9	60+
39w	3	539	L2, M1, T3, W1	Y	Low Severity Prescribed Fire	Hand, Fire	L	DF	10.0-14.9	60+
40	2	22	W1	Y	Precommercial Thin	Mech, Fire	L	DF/LP	5.0-9.9	60+
	3	22	W1	Y	Precommercial Thin	Hand, Fire	L	DF/LP	5.0-9.9	60+
41	2	43	T3	Y	Precommercial Thin	Mech, Fire	N	DF/LP	5.0-9.9	60+
	3	43	T3	Y	Precommercial Thin	Mech, Fire	N	DF/LP	5.0-9.9	60+
42	2	103	T1, L1	Y	Low Severity Prescribed Fire	Hand, Fire	N	PP/DF	15.0+	40-60

Unit ID	Alternative (2/3)	Alternative Acres	MA/BLM	Wildland Urban Interface	Treatment Type	Treatment Method	IRA (J/L/N)	Dominant Species	Size Class (DBH)	Canopy Cover (%)
43a	3	103	T1, L1	Y	Low Severity Prescribed Fire	Hand, Fire	N	PP/DF	15.0+	40-60
	2	146	T5, T1	Y	Low Severity Prescribed Fire	Hand, Fire	N	DF	15.0+	40-60
	3	146	T5, T1	Y	Improvement Harvest	Mech, Fire	N	DF	15.0+	40-60
43b	2	14	T1	y	Precommercial Thin	Hand, Fire	N	DF	10.0-14.9	40-60
	3	14	T1	y	Precommercial Thin	Hand, Fire	N	DF	10-14.9	40-60
44	2	53	T5	y	Low Severity Prescribed Fire	Hand, Fire	N	DF	10.0-14.9	40-60
45	2	28	T5	y	Low Severity Prescribed Fire	Hand, Fire	N	DF/LP/G	10.0-14.9	60+
46	2	12	T5	y	Low Severity Prescribed Fire	Hand, Fire	N	LP/G	5.0-9.9	60+
47	2	103	T5	y	Low Severity Prescribed Fire	Hand, Fire	N	DF/LP	10.0-14.9	40-60
48	2	38	T1	y	Precommercial Thin	Hand, Fire	N	DF/LP	10.0-14.9	40-60
	3	38	T1	y	Precommercial Thin	Hand, Fire	N	DF/LP	10.0-14.9	40-60
49a	2	10	T1	y	Regeneration Harvest	Mech, Fire	N	DF	10.0-14.9	60+
49b	2	13	T1	y	Low Severity Prescribed Fire	Hand, Fire	N	DF	15.0+	40-60
49c	2	88	T1	y	Improvement Harvest	Mech, Fire	N	DF	10.0-14.9	40-60
50	2	96	T1	y	Improvement Harvest	Mech, Fire	N	DF	10.0-14.9	40-60
	3	96	T1	y	Improvement Harvest	Mech, Fire	N	DF	10.0-14.9	40-60
51	2	62	T1	y	Improvement Harvest	Mech, Fire	N	DF	10.0-14.9	40-60
	3	62	T1	y	Improvement Harvest	Mech, Fire	N	DF	10.0-14.9	40-60

Unit ID	Alternative (2/3)	Alternative Acres	MA/BLM	Wildland Urban Interface	Treatment Type	Treatment Method	IRA (J/L/N)	Dominant Species	Size Class (DBH)	Canopy Cover (%)
52	2	231	M1	y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	PP/DF	15.0+	40-60
	3	231	M1	y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	PP/DF	15.0+	40-60
53	2	163	M1	y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	PP/DF	15.0+	25-40
	3	163	M1	y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	PP/DF	15.0+	25-40
54	2	41	M1	y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	DF/PP	10.0-14.9	25-40
	3	41	M1	y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	DF/PP	10.0-14.9	25-40
55	2	32	M1	y	Low Severity Prescribed Fire	Hand, Fire	N	DF	10.0-14.9	60+
	3	32	M1	y	Low Severity Prescribed Fire	Hand, Fire	N	DF	10.0-14.9	60+
56A	2	31	M1	y	Improvement Harvest	Mech, Fire	N	DF/LP	10.0-14.9	60+
	3	31	M1	y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	DF/LP	10.0-14.9	60+
56B	2	15	M1	y	Improvement Harvest	Mech, Fire	N	LP	5.0-9.9	60+
	3	15	M1	y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	LP	5.0-9.9	60+
56C	2	17	M1	y	Low Severity Prescribed Fire	Mech, Fire	N	DF	10.0-14.9	60+
	3	17	M1	y	Low Severity Prescribed Fire	Mech, Fire	N	DF	10.0-14.9	60+
56D	2	2	M1	y	Low Severity Prescribed Fire	Mech, Fire	N	DF	10.0-14.9	40-60
	3	2	M1	y	Low Severity Prescribed Fire	Mech, Fire	N	DF	10.0-14.9	40-60
56E	2	23	M1	y	Low Severity Prescribed Fire	Mech, Fire	N	DF/LP	5.0-9.9	60+
	3	23	M1	y	Low Severity Prescribed Fire	Mech, Fire	N	DF/LP	5.0-9.9	60+

Unit ID	Alternative (2/3)	Alternative Acres	MA/BLM	Wildland Urban Interface	Treatment Type	Treatment Method	IRA (J/L/N)	Dominant Species	Size Class (DBH)	Canopy Cover (%)
57	2	90	M1	y	Low Severity Prescribed Fire	Hand, Fire	N	PP/DF	10.0-14.9	40-60
	3	90	M1	y	Low Severity Prescribed Fire	Hand, Fire	N	PP/DF	10.0-14.9	40-60
58	2	50	M1	y	Low Severity Prescribed Fire	Mech, Fire	N	PP/DF	10.0-14.9	60+
	3	50	M1	y	Low Severity Prescribed Fire	Mech, Fire	N	PP/DF	10.0-14.9	60+
59A	2	23	M1	y	Improvement Harvest	Mech, Fire	N	PP/DF	10.0-14.9	25-40
	3	23	M1	y	Improvement Harvest	Mech, Fire	N	PP/DF	10.0-14.9	25-40
59B	2	49	M1	y	Low Severity Prescribed Fire	Hand, Fire	N	DF/G	10.0-14.9	40-60
	3	49	M1	y	Low Severity Prescribed Fire	Hand, Fire	N	DF/G	10.0-14.9	40-60
59C	2	29	M1	y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	DF	10.0-14.9	60+
	3	29	M1	y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	DF	10.0-14.9	60+
60A	2	51	M1	y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	PP	15.0+	<25
	3	51	M1	y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	PP	15.0+	<25
60B	2	86	M1	y	Low Severity Prescribed Fire	Hand, Fire	N	PP	10.0-14.9	<25
	3	86	M1	y	Low Severity Prescribed Fire	Hand, Fire	N	PP	10.0-14.9	<25
60C	2	18	M1	y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	PP	10.0-14.9	<25
	3	18	M1	y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	PP	10.0-14.9	<25
61A	2	13	M1	y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	DF/PP	10.0-14.9	40-60
	3	13	M1	y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	DF/PP	10.0-14.9	40-60

Unit ID	Alternative (2/3)	Alternative Acres	MA/BLM	Wildland Urban Interface	Treatment Type	Treatment Method	IRA (J/L/N)	Dominant Species	Size Class (DBH)	Canopy Cover (%)
61B	2	89	M1	y	Low Severity Prescribed Fire	Hand, Fire	N	PP/DF	15.0+	<25
	3	89	M1	y	Low Severity Prescribed Fire	Hand, Fire	N	PP/DF/G	15.0+	<25
61C	2	32	M1	y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	PP/DF/G	15.0+	40-60
	3	32	M1	y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	PP/DF	15.0+	40-60
61D	2	25	M1	y	Low Severity Prescribed Fire	Hand, Fire	N	PP	15.0+	25-40
	3	25	M1	y	Low Severity Prescribed Fire	Hand, Fire	N	PP	15.0+	25-40
62A	2	40	M1	y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	DF	10.0-14.9	60+
	3	40	M1	y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	DF	10.0-14.9	60+
62B	2	10	M1	y	Low Severity Prescribed Fire	Hand, Fire	N	PP/DF	15.0+	40-60
	3	10	M1	y	Low Severity Prescribed Fire	Hand, Fire	N	PP/DF	15.0+	40-60
63	2	148	M1	y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	PP/DF/G	10.0-14.9	40-60
	3	148	M1	y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	PP/DF/G	10.0-14.9	40-60
64A	2	96	M1	y	Low Severity Prescribed Fire	Hand, Fire	N	PP/G	10.0-14.9	25-40
	3	96	M1	y	Low Severity Prescribed Fire	Hand, Fire	N	PP/G	15.0+	25-40
64B	2	15	M1	y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	PP/DF	15.0+	40-60
	3	15	M1	y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	PP/DF	10.0-14.9	40-60
65	2	744	M1, R1	y	Low Severity Prescribed Fire	Hand, Fire	N	DF/G	10.0-14.9	40-60
	3	744	M1, R1	y	Low Severity Prescribed Fire	Hand, Fire	N	DF/G	10.0-14.9	40-60

Unit ID	Alternative (2/3)	Alternative Acres	MA/BLM	Wildland Urban Interface	Treatment Type	Treatment Method	IRA (J/L/N)	Dominant Species	Size Class (DBH)	Canopy Cover (%)
66	2	65	M1	y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	PP/DF	10.0-14.9	40-60
	3	65	M1	y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	PP/DF	10.0-14.9	40-60
67	2	84	R1	y	Low Severity Prescribed Fire	Hand, Fire	N	PP/DF	10.0-14.9	40-60
	3	83	R1	y	Low Severity Prescribed Fire	Hand, Fire	N	PP/DF	10.0-14.9	40-60
68	2	431	R1	y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	PP/DF	10.0-14.9	25-40
	3	260	R1	y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	PP/DF	10.0-14.9	25-40
69	2	30	M1	y	Improvement Harvest	Mech, Fire	L	DF	10.0-14.9	40-60
	3	13	M1	y	Low Severity Prescribed Fire	Mech, Fire	L	DF	10.0-14.9	40-60
70	2	50	R1, M1	y	Low Severity Prescribed Fire	Hand, Fire	L	DF	10.0-14.9	60+
71	2	42	M1	y	Improvement Harvest	Mech, Fire	N	PP	15.0+	25-40
	3	42	M1	y	Improvement Harvest	Mech, Fire	N	PP	15.0+	25-40
72	2	36	M1	y	Private Land Buffers	Mech, Hand, Fire	N	DF	10.0-14.9	60+
	3	36	M1	y	Private Land Buffers	Mech, Hand, Fire	N	DF	10.0-14.9	60+
73A	2	29	T1	y	Precommercial Thin	Mech, Fire	N	DF	10.0-14.9	40-60
	3	29	T1	y	PREcommercial Thin	Mech, Fire	N	DF	10.0-14.9	40-60
73B	2	88	T1	y	Improvement Harvest	Mech, Fire	N	DF	15.0+	40-60
	3	88	T1	y	Improvement Harvest	Mech, Fire	N	DF	15.0+	40-60
73C	2	11	T1	y	Precommercial Thin	Mech, Fire	N	DF	10.0-14.9	40-60

Unit ID	Alternative (2/3)	Alternative Acres	MA/BLM	Wildland Urban Interface	Treatment Type	Treatment Method	IRA (J/L/N)	Dominant Species	Size Class (DBH)	Canopy Cover (%)
73D	3	11	T1	y	Precommercial Thin	Mech, Fire	N	DF	10.0-14.9	40-60
	2	43	T1	y	Precommercial Thin	Mech, Fire	N	PP	15.0+	25-40
	3	43	T1	y	Precommercial Thin	Mech, Fire	N	PP	15.0+	25-40
73E	2	38	T1	y	Improvement Harvest	Mech, Fire	N	PP/DF	15.0+	25-40
	3	38	T1	y	Improvement Harvest	Mech, Fire	N	PP/DF	15.0+	25-40
75	2	72	T1, L1	y	Improvement Harvest	Mech, Fire	N	PP/DF	10.0-14.9	25-40
	3	72	T1, L1	y	Improvement Harvest	Mech, Fire	N	PP/DF	10.0-14.9	25-40
76	2	116	T1	y	Improvement Harvest	Mech, Fire	N	PP/DF	15.0+	25-40
	3	116	T1	y	Improvement Harvest	Mech, Fire	N	PP/DF	15.0+	25-40
77	2	147	T1	y	Low Severity Prescribed Fire	Hand, Fire	N	PP/DF/G	15.0+	25-40
	3	147	T1	y	Low Severity Prescribed Fire	Hand, Fire	N	PP/DF/G	15.0+	25-40
78	2	249	T1, T5	y	Improvement Harvest	Mech, Fire	N	PP/DF	15.0+	25-40
	3	249	T1, T5	y	Improvement Harvest	Mech, Fire	N	PP/DF	15.0+	25-40
80	2	56	T1	y	Mixed Severity Prescribed Fire	Hand, Fire	N	DF/G	10.0-14.9	60+
81	2	76	T1	Y	Improvement Harvest	Mech	N	DF	10.0-14.9	60+
	3	76	T1	Y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	DF	10.0-14.9	60+
84B	2	40	L1	Y	Improvement Harvest	Mech, Fire	N	LP	5.0-9.9	60+
84C	2	18	M1	Y	Regeneration Harvest	Mech, Fire	N	DF/LP	5.0-9.9	60+

Unit ID	Alternative (2/3)	Alternative Acres	MA/BLM	Wildland Urban Interface	Treatment Type	Treatment Method	IRA (J/L/N)	Dominant Species	Size Class (DBH)	Canopy Cover (%)
85A	2	50	T1	Y	Improvement Harvest	Hand, Fire	N	DF/G	15.0+	25-40
85B	2	45	T1	Y	Improvement Harvest	Mech, Fire	N	DF/LP	10.0-14.9	60+
85C	2	22	T1	Y	Regeneration Harvest	Mech, Fire	N	LP	5.0-9.9	60+
86A	2	126	R1	Y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	DF/PP	15.0+	25-40
	3	126	R1	Y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	DF/PP	15.0+	25-40
86B	2	135	R1	Y	Low Severity Prescribed Fire	Hand, Fire	N	PP/DF/G	15.0+	<25
	3	135	R1	Y	Low Severity Prescribed Fire	Hand, Fire	N	PP/DF/G	15.0+	<25
87A	2	58	R1	Y	Low Severity Prescribed Fire	Hand, Fire	N	PP	15.0+	<25
	3	58	R1	Y	Low Severity Prescribed Fire	Hand, Fire	N	PP	15.0+	<25
87B	2	32	R1	Y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	PP	15.0+	25-40
88	2	81	R1, M1	Y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	PP	15.0+	25-40
	3	81	R1, M1	Y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	PP	15.0+	25-40
89A	2	7	R1, M1	Y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	DF	10.0-14.9	60+
89B	2	26	R1, M1	Y	Low Severity Prescribed Fire	Hand, Fire	N	PP/DF	15.0+	25-40
	3	26	R1, M1	Y	Low Severity Prescribed Fire	Hand, Fire	N	PP/DF	15.0+	25-40
89C	2	11	R1, M1	Y	Improvement Harvest	Mech, Fire	N	DF	10.0-14.9	40-60
	3	11	R1, M1	Y	Improvement Harvest	Mech, Fire	N	DF	10.0-14.9	40-60
90A	2	156	M1, T1, L1, R1	Y	Shaded Fuel Break	Mech, Hand, Fire	L	DF/LP	10.0-14.9	60+

Unit ID	Alternative (2/3)	Alternative Acres	MA/BLM	Wildland Urban Interface	Treatment Type	Treatment Method	IRA (J/L/N)	Dominant Species	Size Class (DBH)	Canopy Cover (%)
	3	156	M1, T1, L1, R1	Y	Shaded Fuel Break	Hand, Fire	L	DF/LP	10.0-14.9	60+
90B	2	513	M1, T1, L1, R1	Y	Low Severity Prescribed Fire	Mech, Hand, Fire	L	DF/LP	10.0-14.9	60+
	3	513	M1, T1, L1, R1	Y	Low Severity Prescribed Fire	Hand, Fire	L	DF/LP	10.0-14.9	60+
92A	2	2	R1	Y	Low Severity Prescribed Fire	Hand, Fire	N	DF	10.0-14.9	40-60
92B	2	12	R1	Y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	DF	10.0-14.9	60+
92C	2	73	R1	Y	Low Severity Prescribed Fire	Hand, Fire	N	PP/DF	10.0-14.9	25-40
92D	2	9	R1	Y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	DF	10.0-14.9	60+
92E	2	10	R1	Y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	DF	10.0-14.9	60+
93	2	339	R1	Y	Low Severity Prescribed Fire	Hand, Fire	N	PP/DF/G	10.0-14.9	25-40
	3	339	R1	Y	Low Severity Prescribed Fire	Hand, Fire	N	PP/DF/G	10.0-14.9	25-40
94A	2	12	T1, T5	Y	Improvement Harvest	Mech, Fire	N	DF	10.0-14.9	60+
94B	2	88	T1, T5	Y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	DF	15.0+	40-60
94C	2	10	T5	Y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	DF	15.0+	25-40
94D	2	22	T5	Y	Improvement Harvest	Mech, Fire	N	DF	15.0+	60+
94E	2	1	T1, T5	Y	Improvement Harvest	Mech, Fire	N	DF	15.0+	25-40
94F	2	35	T1, T5	Y	Improvement Harvest	Mech, Fire	N	DF	10.0-14.9	60+
94G	2	20	T1, T5	Y	Improvement Harvest	Mech, Fire	N	DF	15.0+	40-60
96	2	16	T5	Y	Low Severity Prescribed Fire	Hand, Fire	N	LP/DF	10.0-14.9	60+

Unit ID	Alternative (2/3)	Alternative Acres	MA/BLM	Wildland Urban Interface	Treatment Type	Treatment Method	IRA (J/L/N)	Dominant Species	Size Class (DBH)	Canopy Cover (%)
97A	2	226	T5, M1, T1, L1	Y	Regeneration Harvest	Mech, Fire	L	DF/LP	5.0-9.9	40-60
97C	2	18	T5, M1, T1, L1	Y	Regeneration Harvest	Mech, Fire	N	DF	10.0-14.9	40-60
98A	2	39	T1	Y	Low Severity Prescribed Fire	Hand, Fire	N	DF/LP	10.0-14.9	60+
98C	2	57	T1, M1	Y	Regeneration Harvest	Mech, Fire	N	LP	5.0-9.9	60+
98D	2	25	T1	Y	Low Severity Prescribed Fire	Hand, Fire	N	LP	10.0-14.9	60+
98E	2	63	T1	Y	Low Severity Prescribed Fire	Hand, Fire	N	DF/LP	10.0-14.9	60+
98F	2	24	T1	Y	Low Severity Prescribed Fire	Hand, Fire	N	DF	10.0-14.9	60+
98G	2	68	T1, M1	Y	Regeneration Harvest	Mech, Fire	N	LP	5.0-9.9	60+
98H	2	132	T1, M1	Y	Regeneration Harvest	Mech, Fire	N	DF/LP	5.0-9.9	60+
100a	2	10	T1, M1	y	Improvement Harvest	Mech, Fire	N	S	15.0+	60+
	3	10	T1, M1	y	Improvement Harvest	Mech, Fire	N	S	15.0+	60+
100b	2	148	L1, T1, M1	y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	DF	10.0-14.9	40-60
	3	148	L1, T1, M1	y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	DF	10.0-14.9	40-60
100c	2	43	T1, M1	y	Improvement Harvest	Mech, Fire	N	DF	10.0-14.9	40-60
	3	43	T1, M1	y	Improvement Harvest	Mech, Fire	N	DF	10.0-14.9	40-60
101	2	107	L1, M1	y	Improvement Harvest	Mech, Fire	N	DF	10.0-14.9	60+
	3	107	L1, M1	Y	Improvement Harvest	Mech, Fire	N	DF	10.0-14.9	60+
102	2	154	R1	y	Low Severity Prescribed Fire	Hand, Fire	L	DF/LP	10.0-14.9	60+

Unit ID	Alternative (2/3)	Alternative Acres	MA/BLM	Wildland Urban Interface	Treatment Type	Treatment Method	IRA (J/L/N)	Dominant Species	Size Class (DBH)	Canopy Cover (%)
	3	171	R1	Y	Low Severity Prescribed Fire	Hand, Fire	L	DF/LP	10.0-14.9	60+
102a	2	17	R1	Y	Improvement Harvest	Mech, Fire	L	DF	15.0+	40-60
103a	2	43	M1	Y	Improvement Harvest	Mech, Fire	N	PP/DF	10.0-14.9	60+
	3	17	M1	Y	Improvement Harvest	Mech, Fire	N	PP/DF	10.0-14.9	60+
103b	2	5	M1	Y	Low Severity Prescribed Fire	Hand, Fire	N	DF	15.0+	40-60
	3	5	M1	Y	Low Severity Prescribed Fire	Hand, Fire	N	DF	15.0+	40-60
103c	2	44	M1	y	Low Severity Prescribed Fire	Hand, Fire	N	DF	10.0-14.9	60+
	3	44	M1	Y	Low Severity Prescribed Fire	Hand, Fire	N	DF	10.0-14.9	60+
103d	3	25	M1	y	Improvement Harvest	Mech, Fire	N	DF	10.0-14.9	60+
104	2	58	T5	Y	Regeneration Harvest	Mech, Fire	N	LP	5.0-9.9	60+
105	2	44	T1	y	Low Severity Prescribed Fire	Hand, Fire	N	DF	10.0-14.9	40-60
	3	184	T1	Y	Low Severity Prescribed Fire	Hand, Fire	N	DF	10.0-14.9	40-60
106a	2	260	T5, T1	y	Regeneration Harvest	Mech, Fire	N	LP	5.0-9.9	60+
	3	37	T5, T1	Y	Regeneration Harvest	Mech, Fire	N	LP	5.0-9.9	60+
106b	2	32	T5, T1	Y	Improvement Harvest	Mech, Fire	N	DF	10.0-14.9	60+
106c	2	20	T5, T1	Y	Regeneration Harvest	Mech, Fire	N	LP	5.0-9.9	40-60
106d	2	43	T5, T1	Y	Improvement Harvest	Mech, Fire	N	DF	10.0-14.9	60+
106e	2	80	T5, T1	Y	Regeneration Harvest	Mech, Fire	N	LP	5.0-9.9	60+

Unit ID	Alternative (2/3)	Alternative Acres	MA/BLM	Wildland Urban Interface	Treatment Type	Treatment Method	IRA (J/L/N)	Dominant Species	Size Class (DBH)	Canopy Cover (%)
106f	2	28	T5, T1	Y	Improvement Harvest	Mech, Fire	N	DF	10.0-14.9	40-60
106g	2	37	T5, T1	Y	Regeneration Harvest	Mech, Fire	N	LP	5.0-9.9	40-60
106h	2	18	T5	Y	Improvement Harvest	Mech, Fire	N	DF	10.0-14.9	60+
107a	2	65	M1	y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	DF	10.0-14.9	60+
	3	65	M1	y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	DF	10.0-14.9	60+
107b	2	48	M1, T1	y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	DF	10.0-14.9	60+
	3	80	M1, T1	y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	DF	10.0-14.9	60+
107c	2	41	M1, T1	y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	DF	10.0-14.9	60+
	3	41	M1, T1	y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	DF	10.0-14.9	60+
110a	2	11	T1	Y	Regeneration Harvest	Mech, Fire	N	DF	10.0-14.9	40-60
110b	2	86	T1	y	Regeneration Harvest	Mech, Fire	N	DF	10.0-14.9	40-60
	3	58	T1	Y	Regeneration Harvest	Mech, Fire	N	DF	10.0-14.9	40-60
110c	2	14	T1		Regeneration Harvest	Mech, Fire		DF	10.0-14.9	40-60
112	2	19	M1	y	Improvement Harvest	Mech, Fire	N	DF	10.0-14.9	40-60
	3	19	M1	y	Improvement Harvest	Mech, Fire	N	DF	10.0-14.9	40-60
113	2	83	M1	y	Low Severity Prescribed Fire	Hand, Fire	N	DF/LP	5.0-9.9	60+
	3	83	M1	y	Low Severity Prescribed Fire	Hand, Fire	N	DF/LP	5.0-9.9	60+
114a	2	9	T1	y	Improvement Harvest	Mech, Fire	N	DF	10.0-14.9	40-60

Unit ID	Alternative (2/3)	Alternative Acres	MA/BLM	Wildland Urban Interface	Treatment Type	Treatment Method	IRA (J/L/N)	Dominant Species	Size Class (DBH)	Canopy Cover (%)
114b	3	9	T1	y	Improvement Harvest	Mech, Fire	N	DF	10.0-14.9	40-60
	2	42	T1	y	Low Severity Prescribed Fire	Mech, Fire	N	DF	10.0-14.9	40-60
	3	42	T1	y	Low Severity Prescribed Fire	Mech, Fire	N	DF	10.0-14.9	40-60
116a	2	76	T5, W2, T4, M1	y	Low Severity Prescribed Fire	Hand, Fire	L	DF	10.0-14.9	40-60
	3	72	T5, W2, T4, M1	y	Low Severity Prescribed Fire	Hand, Fire	L	DF	10.0-14.9	40-60
116b	2	463	T5, W2, T4, M1	y	Low Severity Prescribed Fire	Hand, Fire	L	DF/LP	10.0-14.9	60+
116c	2	437	M1, L1, L2	y	Mixed Severity Prescribed Fire	Hand, Fire	L	DF	10.0-14.9	60+
	3	220	M1, L1, L2	Y	Low Severity Prescribed Fire	Hand, Fire	L	DF	10.0-14.9	60+
116d	3	18	T5, L2	y	Shaded Fuel Break	Hand, Fire	L	DF	10.0-14.9	60+
116e	2	24	T5, W2, T4, M1	y	Low Severity Prescribed Fire	Hand, Fire	L	DF	10.0-14.9	40-60
	3	23	T5, W2, T4, M1	Y	Low Severity Prescribed Fire	Hand, Fire	L	DF	10.0-14.9	40-60
116f	2	28	T5, W2, T4, M1	y	Low Severity Prescribed Fire	Hand, Fire	L	DF	10.0-14.9	60+
	3	28	T5, W2, T4, M1	Y	Low Severity Prescribed Fire	Hand, Fire	L	DF	10.0-14.9	60+
116g	2	347	T5, W2, T4, M1	y	Low Severity Prescribed Fire	Hand, Fire	L	DF	10.0-14.9	60+
	3	348	T5, W2, T4, M1	Y	Low Severity Prescribed Fire	Hand, Fire	L	DF	10.0-14.9	60+
116h	2	46	M1, L1, L2	Y	Mixed Severity Prescribed Fire	Mech, Hand, Fire	N	DF	5.0-9.9	60+
116i	2	130	M1, L1, L2	Y	Mixed Severity Prescribed Fire	Mech, Hand, Fire	N	DF/LP	10.0-14.9	40-60
116j	3	31	T5	y	Low Severity Grassland Prescribed Fire	Hand, Fire	L	DF/G	10.0-14.9	40-60

Unit ID	Alternative (2/3)	Alternative Acres	MA/BLM	Wildland Urban Interface	Treatment Type	Treatment Method	IRA (J/L/N)	Dominant Species	Size Class (DBH)	Canopy Cover (%)
116k	3	18	T5	y	Shaded Fuel Break	Hand, Fire	L	DF	10.0-14.9	60+
116l	3	15	L2	y	Shaded Fuel Break	Hand, Fire	L	DF	10.0-14.9	60+
116 m	3	135	T5, L2	Y	Mixed Severity Prescribed Fire	Hand, Fire	L	DF	10.0-14.9	60+
117	2	64	H1	y	Improvement Harvest	Mech, Fire	N	SAF	5.0-9.9	60+
	3	64	H1	Y	Improvement Harvest	Mech, Fire	N	SAF	5.0-9.9	60+
118	2	168	M1, T1	Y	Regeneration Harvest	Mech, Fire	N	LP	5.0-9.9	40-60
119	2	28	T1	Y	Improvement Harvest	Mech, Fire	N	DF	10.0-14.9	40-60
121	2	19	T1	y	Precommercial Thin	Mech, Hand, Fire	N	DF/LP	5.0-9.9	60+
	3	19	T1	Y	Precommercial Thin	Mech, Hand, Fire	N	DF/LP	5.0-9.9	60+
122a	2	170	M1	y	Low Severity Prescribed Fire	Mech, Fire	N	DF/LP	10.0-14.9	60+
	3	170	M1	Y	Low Severity Prescribed Fire	Mech, Fire	N	DF/LP	10.0-14.9	60+
122b	2	227	M1	y	Low Severity Prescribed Fire	Hand, Fire	N	DF	10.0-14.9	60+
	3	227	M1	Y	Low Severity Prescribed Fire	Hand, Fire	N	DF	10.0-14.9	60+
122c	2	26	M1	y	Low Severity Prescribed Fire	Hand, Fire	N	LP	5.0-9.9	60+
	3	26	M1	Y	Low Severity Prescribed Fire	Hand, Fire	N	LP	5.0-9.9	60+
123	3	313	L1, T5, T1	Y	Private Land Buffers	Mech, Hand, Fire	N	DF/LP	10.0-14.9	60+
123A	2	54	L1, T5, T1	y	Private Land Buffers	Mech, Hand, Fire	N	DF	10.0-14.9	60+
123B	2	20	L1, T5, T1	Y	Private Land Buffers	Mech, Hand, Fire	N	LP	10.0-14.9	60+

Unit ID	Alternative (2/3)	Alternative Acres	MA/BLM	Wildland Urban Interface	Treatment Type	Treatment Method	IRA (J/L/N)	Dominant Species	Size Class (DBH)	Canopy Cover (%)
123 C	2	37	L1, T5, T1	Y	Private Land Buffers	Mech, Hand, Fire	N	LP	5.0-9.9	60+
123 D	2	80	L1, T5, T1	Y	Private Land Buffers	Mech, Hand, Fire	N	DF	10.0-14.9	60+
124a	2	22	M1	y	Private Land Buffers	Mech, Hand, Fire	N	DF/LP	10.0-14.9	60+
	3	22	M1	y	Private Land Buffers	Mech, Hand, Fire	N	DF/LP	10.0-14.9	60+
124b	2	12	M1	y	Private Land Buffers	Mech, Hand, Fire	N	LP	5.0-9.9	60+
	3	12	M1	y	Private Land Buffers	Mech, Hand, Fire	N	LP	5.0-9.9	60+
125	2	22	T1	y	Private Land Buffers	Mech, Hand, Fire	N	DF/LP	10.0-14.9	60+
	3	22	Y1	y	Private Land Buffers	Mech, Hand, Fire	N	DF/LP	10.0-14.9	60+
126	2	181	T1, M1	y	Private Land Buffers	Mech, Hand, Fire	N	DF/LP	10.0-14.9	60+
	3	181	T1, M1	y	Private Land Buffers	Mech, Hand, Fire	N	DF/LP	10.0-14.9	60+
127a	2	1	H1	y	Private Land Buffers	Mech, Hand, Fire	N	DF	10.0-14.9	60+
	3	1	H1	y	Private Land Buffers	Mech, Hand, Fire	N	DF	10.0-14.9	60+
127b	2	1	H1	y	Private Land Buffers	Mech, Hand, Fire	N	DF	10.0-14.9	60+
	3	1	H1	y	Private Land Buffers	Mech, Hand, Fire	N	DF	10.0-14.9	60+
127c	2	0	H1	y	Private Land Buffers	Mech, Hand, Fire	N	DF	10.0-14.9	60+
	3	0	H1	y	Private Land Buffers	Mech, Hand, Fire	N	DF	10.0-14.9	60+
127d	2	0	H1	y	Private Land Buffers	Mech, Hand, Fire	N	DF	10.0-14.9	60+
	3	0	H1	y	Private Land Buffers	Mech, Hand, Fire	N	DF	10.0-14.9	60+

Unit ID	Alternative (2/3)	Alternative Acres	MA/BLM	Wildland Urban Interface	Treatment Type	Treatment Method	IRA (J/L/N)	Dominant Species	Size Class (DBH)	Canopy Cover (%)
127e	2	1	H1	y	Private Land Buffers	Mech, Hand, Fire	N	DF	10.0-14.9	60+
	3	1	H1	y	Private Land Buffers	Mech, Hand, Fire	N	DF	10.0-14.9	60+
127f	2	0	H1	y	Private Land Buffers	Mech, Hand, Fire	N	DF	5.0-9.9	60+
	3	0	H1	y	Private Land Buffers	Mech, Hand, Fire	N	DF	5.0-9.9	60+
127g	2	0	H1	y	Private Land Buffers	Mech, Hand, Fire	N	LP	5.0-9.9	60+
	3	0	H1	y	Private Land Buffers	Mech, Hand, Fire	N	LP	5.0-9.9	60+
127h	2	0	H1	y	Private Land Buffers	Mech, Hand, Fire	N	DF	5.0-9.9	60+
	3	0	H1	y	Private Land Buffers	Mech, Hand, Fire	N	DF	5.0-9.9	60+
127i	2	7	H1	y	Private Land Buffers	Mech, Hand, Fire	N	DF	10.0-14.9	60+
	3	7	H1	y	Private Land Buffers	Mech, Hand, Fire	N	DF	10.0-14.9	60+
127j	2	2	H1	y	Private Land Buffers	Mech, Hand, Fire	N	DF	10.0-14.9	60+
	3	2	H1	y	Private Land Buffers	Mech, Hand, Fire	N	DF	10.0-14.9	60+
127k	2	1	H1	y	Private Land Buffers	Mech, Hand, Fire	N	LP	5.0-9.9	60+
	3	1	H1	y	Private Land Buffers	Mech, Hand, Fire	N	LP	5.0-9.9	60+
127l	2	0	H1	y	Private Land Buffers	Mech, Hand, Fire	N	LP	5.0-9.9	60+
	3	0	H1	y	Private Land Buffers	Mech, Hand, Fire	N	LP	5.0-9.9	60+
127m	2	1	H1	y	Private Land Buffers	Mech, Hand, Fire	N	LP	5.0-9.9	60+
	3	1	H1	y	Private Land Buffers	Mech, Hand, Fire	N	LP	5.0-9.9	60+

Unit ID	Alternative (2/3)	Alternative Acres	MA/BLM	Wildland Urban Interface	Treatment Type	Treatment Method	IRA (J/L/N)	Dominant Species	Size Class (DBH)	Canopy Cover (%)
127n	2	1	H1	y	Private Land Buffers	Mech, Hand, Fire	N	DF	5.0-9.9	60+
	3	1	H1	y	Private Land Buffers	Mech, Hand, Fire	N	DF	5.0-9.9	60+
127o	2	6	H1	y	Private Land Buffers	Mech, Hand, Fire	N	DF	10.0-14.9	40-60
	3	6	H1	y	Private Land Buffers	Mech, Hand, Fire	N	DF	10.0-14.9	40-60
127p	2	1	H1	y	Private Land Buffers	Mech, Hand, Fire	N	DF	5.0-9.9	60+
	3	1	H1	y	Private Land Buffers	Mech, Hand, Fire	N	DF	5.0-9.9	60+
127q	2	0	H1	y	Private Land Buffers	Mech, Hand, Fire	N	DF	5.0-9.9	40-60
	3	0	H1	y	Private Land Buffers	Mech, Hand, Fire	N	DF	5.0-9.9	40-60
127r	2	1	H1	y	Private Land Buffers	Mech, Hand, Fire	N	LP	10.0-14.9	60+
	3	1	H1	y	Private Land Buffers	Mech, Hand, Fire	N	LP	10.0-14.9	60+
128	2	107	H1	y	Private Land Buffers	Mech, Hand, Fire	L	DF/LP	5.0-9.9	60+
	3	107	H1	y	Private Land Buffers	Mech, Hand, Fire	L	DF/LP	5.0-9.9	60+
129a	2	213	H1, H2	y	Private Land Buffers	Mech, Hand, Fire	L	DF/LP	5.0-9.9	60+
	3	213	H1, H2	y	Private Land Buffers	Mech, Hand, Fire	L	DF/LP	5.0-9.9	60+
129b	2	93	H1, H2	y	Private Land Buffers	Mech, Hand, Fire	N	DF/LP	5.0-9.9	60+
	3	93	H1, H2	y	Private Land Buffers	Mech, Hand, Fire	N	DF/LP	5.0-9.9	60+
129c	2	221	H1, H2	y	Private Land Buffers	Mech, Hand, Fire	N	DF/LP/G	5.0-9.9	60+
	3	221	H1, H2	y	Private Land Buffers	Mech, Hand, Fire	N	DF/LP/G	5.0-9.9	60+

Unit ID	Alternative (2/3)	Alternative Acres	MA/BLM	Wildland Urban Interface	Treatment Type	Treatment Method	IRA (J/L/N)	Dominant Species	Size Class (DBH)	Canopy Cover (%)
129d	2	55	H1, H2	y	Private Land Buffers	Mech, Hand, Fire	N	LP	5.0-9.9	60+
	3	55	H1, H2	y	Private Land Buffers	Mech, Hand, Fire	N	LP	5.0-9.9	60+
129e	2	384	H1, H2	y	Private Land Buffers	Mech, Hand, Fire	N	DF/LP	5.0-9.9	60+
	3	384	H1, H2	y	Private Land Buffers	Mech, Hand, Fire	N	DF/LP	5.0-9.9	60+
130	2	46	T5	y	Regeneration Harvest	Mech, Fire	N	LP	5.0-9.9	60+
131	2	6	T1	y	Precommercial Thin	Mech, Hand, Fire	N	LP	5.0-9.9	60+
132	2	8	T1	y	Precommercial Thin	Mech, Hand, Fire	N	LP	5.0-9.9	60+
133	2	12	T4	y	Precommercial Thin	Mech, Hand, Fire	N	LP	5.0-9.9	60+
	3	12	T4	y	Precommercial Thin	Mech, Hand, Fire	N	LP	5.0-9.9	60+
134	2	19	T4	y	Precommercial Thin	Mech, Hand, Fire	N	LP	5.0-9.9	60+
	3	19	T4	y	Precommercial Thin	Mech, Hand, Fire	N	LP	5.0-9.9	60+
135	2	38	T4, H1	y	Precommercial Thin	Hand, Fire	L	DF/LP	5.0-9.9	60+
	3	38	T4, H1	y	Precommercial Thin	Hand, Fire	L	DF/LP	5.0-9.9	60+
136	2	193	T1, T5, L1	y	Improvement Harvest	Mech, Hand, Fire	N	DF	10.0-14.9	60+
	3	193	T1, T5, L1	y	Improvement Harvest	Mech, Hand, Fire	N	DF	10.0-14.9	60+
137	2	41	T1	y	Precommercial Thin	Mech, Hand, Fire	N	DF/LP	5.0-9.9	<25
	3	41	T1	y	Precommercial Thin	Mech, Hand, Fire	N	DF/LP	5.0-9.9	<25
138	2	35	T1	y	Precommercial Thin	Mech, Hand, Fire	N	DF	10.0-14.9	40-60

Unit ID	Alternative (2/3)	Alternative Acres	MA/BLM	Wildland Urban Interface	Treatment Type	Treatment Method	IRA (J/L/N)	Dominant Species	Size Class (DBH)	Canopy Cover (%)
	3	35	T1	y	Precommercial Thin	Mech, Hand, Fire	N	DF	10.0-14.9	40-60
139	2	84	BLM	y	Low Severity Prescribed Fire	Hand, Fire	N	DF/G	10.0-14.9	60+
	3	84	BLM	Y	Low Severity Prescribed Fire	Hand, Fire	N	DF/G	10.0-14.9	60+
140	2	181	BLM	y	Improvement Harvest	Mech, Hand, Fire	N	DF/LP	10.0-14.9	60+
	3	185	BLM	Y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	DF/LP	10.0-14.9	60+
141	2	127	H1, T4	y	Low Severity Prescribed Fire	Hand, Fire	L	DF/LP	5.0-9.9	60+
	3	127	H1, T4	Y	Low Severity Prescribed Fire	Hand, Fire	L	DF/LP	5.0-9.9	60+
142a	2	49	BLM	y	Regeneration Harvest	Mech, Fire	N	DF	10.0-14.9	60+
	3	41	BLM	Y	Low Severity Prescribed Fire	Mech, Fire	N	DF	10.0-14.9	60+
142b	2	32	BLM	y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	DF/G	15.0+	25-40
	3	30	BLM	Y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	DF/G	15.0+	25-40
142c	3	6	BLM	Y	Private Land Buffers	Mech, Hand, Fire	N	DF/LP	10.0-14.9	60+
142d	3	2	BLM	Y	Private Land Buffers	Mech, Hand, Fire	N	G	N/A	N/A
143a	2	184	BLM	y	Regeneration Harvest	Mech, Fire	N	PP/DF/LP	10.0-14.9	40-60
	3	174	BLM	Y	Low Severity Prescribed Fire	Mech, Fire	N	PP/DF/LP	10.0-14.9	40-60
143b	2	58	BLM	y	Improvement Harvest	Mech, Fire	N	DF	5.0-9.9	60+
	3	59	BLM	Y	Low Severity Prescribed Fire	Mech, Fire	N	DF	5.0-9.9	60+
143c	3	10	BLM	y	Private Land Buffers	Mech, Hand, Fire	N	PP/DF	10.0-14.9	25-40

Unit ID	Alternative (2/3)	Alternative Acres	MA/BLM	Wildland Urban Interface	Treatment Type	Treatment Method	IRA (J/L/N)	Dominant Species	Size Class (DBH)	Canopy Cover (%)
144	2	67	T4, T5,L1	y	Shaded Fuel Break	Mech, Hand, Fire	J	DF/LP	5.0-9.9	40-60
145	2	186	H1, H2, M1	y	Shaded Fuel Break	Mech, Hand, Fire	J	LP/G	5.0-9.9	40-60
	3	166	H1, H2, M1	Y	Shaded Fuel Break	Mech, Hand, Fire	J	LP/G	5.0-9.9	40-60
146	2	134	BLM	y	Low Severity Prescribed Fire	Hand, Fire	N	PP/DF	10.0-14.9	40-60
	3	134	BLM	Y	Low Severity Prescribed Fire	Hand, Fire	N	PP/DF	10.0-14.9	40-60
147	2	27	BLM	y	Improvement Harvest	Mech, Fire	N	DF/G	10.0-14.9	60+
	3	27	BLM	Y	Low Severity Prescribed Fire	Hand, Fire	N	DF/G	10.0-14.9	60+
148	2	26	BLM	y	Improvement Harvest	Mech, Fire	N	PP/G	15.0+	25-40
	3	26	BLM	Y	Low Severity Prescribed Fire	Mech, Fire	N	PP/G	15.0+	25-40
149	2	120	H1	y	Private Land Buffers	Mech, Hand, Fire	L	DF/LP	5.0-9.9	60+
	3	120	H1	Y	Private Land Buffers	Mech, Hand, Fire	L	DF/LP	5.0-9.9	60+
150	2	36	T1	y	Private Land Buffers	Mech, Hand, Fire	N	DF/LP	5.0-9.9	60+
	3	36	T1	Y	Private Land Buffers	Mech, Hand, Fire	N	DF/LP	5.0-9.9	60+
151	2	22	H2	y	Private Land Buffers	Mech, Hand, Fire	N	LP/G	5.0-9.9	60+
	2	22	H2	y	Private Land Buffers	Mech, Hand, Fire	N	LP/G	5.0-9.9	60+
152	2	15	H2	y	Private Land Buffers	Mech, Hand, Fire	J	LP	5.0-9.9	60+
153	2	33	H2	y	Private Land Buffers	Mech, Hand, Fire	J	LP	5.0-9.9	60+
154	2	33	H2	y	Private Land Buffers	Mech, Hand, Fire	N	LP	5.0-9.9	40-60

Unit ID	Alternative (2/3)	Alternative Acres	MA/BLM	Wildland Urban Interface	Treatment Type	Treatment Method	IRA (J/L/N)	Dominant Species	Size Class (DBH)	Canopy Cover (%)
	3	33	H2	y	Private Land Buffers	Mech, Hand, Fire	N	LP	5.0-9.9	60+
155	2	43	H1	y	Private Land Buffers	Mech, Hand, Fire	N	LP	5.0-9.9	60+
156	2	26	M1	y	Private Land Buffers	Mech, Hand, Fire	N	LP	5.0-9.9	60+
	3	26	M1	y	Private Land Buffers	Mech, Hand, Fire	N	LP	5.0-9.9	60+
157	2	20	T5	y	Private Land Buffers	Mech, Hand, Fire	N	DF/G	10.0-14.9	40-60
	3	20	T5	y	Private Land Buffers	Mech, Hand, Fire	N	DF/G	10.0-14.9	40-60
158	2	34	T4, H1	Y	Low Severity Prescribed Fire	Hand, Fire	L	DF	10.0-14.9	40-60
	3	34	T4, H1	y	Low Severity Prescribed Fire	Hand, Fire	L	DF	10.0-14.9	40-60
159	2	53	M1, T4	y	Private Land Buffers	Mech, Hand, Fire	L	DF	10.0-14.9	40-60
	3	53	M1, T4	y	Private Land Buffers	Mech, Hand, Fire	L	DF	10.0-14.9	40-60
160	2	104	M1	y	Private Land Buffers	Mech, Hand, Fire	L	DF/LP	5.0-9.9	60+
	3	104	M1	y	Private Land Buffers	Mech, Hand, Fire	L	DF/LP	5.0-9.9	60+
161	2	23	M1	y	Private Land Buffers	Mech, Hand, Fire	L	DF	10.0-14.9	60+
	3	23	M1	y	Private Land Buffers	Mech, Hand, Fire	L	DF	10.0-14.9	60+
162	2	23	T1, T5	y	Private Land Buffers	Mech, Hand, Fire	N	DF/LP	10.0-14.9	60+
	3	23	T1, T5	y	Private Land Buffers	Mech, Hand, Fire	N	DF/LP	10.0-14.9	60+
163	2	13	BLM	y	Low Severity Prescribed Fire	Hand, Fire	N	PP	15.0+	25-40
	3	13	BLM	y	Low Severity Prescribed Fire	Hand, Fire	N	PP	15.0+	25-40

Unit ID	Alternative (2/3)	Alternative Acres	MA/BLM	Wildland Urban Interface	Treatment Type	Treatment Method	IRA (J/L/N)	Dominant Species	Size Class (DBH)	Canopy Cover (%)
164	2	21	BLM	y	Low Severity Prescribed Fire	Hand, Fire	N	DF	10.0-14.9	40-60
	3	21	BLM	y	Low Severity Prescribed Fire	Hand, Fire	N	DF	10.0-14.9	40-60
165	2	19	BLM	y	Low Severity Prescribed Fire	Hand, Fire	N	PP/DF/G	10.0-14.9	25-40
	3	19	BLM	y	Low Severity Prescribed Fire	Hand, Fire	N	PP/DF/G	10.0-14.9	25-40
166a	2	14	BLM	y	Low Severity Prescribed Fire	Hand, Fire	N	DF/G	15.0+	25-40
	3	14	BLM	y	Low Severity Prescribed Fire	Hand, Fire	N	DF/G	15.0+	25-40
166b	2	14	BLM	y	Low Severity Prescribed Fire	Mech, Fire	N	DF	10.0-14.9	60+
	3	14	BLM	y	Low Severity Prescribed Fire	Hand, Fire	N	DF	10.0-14.9	60+
167	2	22	BLM	y	Low Severity Prescribed Fire	Hand, Fire	N	DF/G	10.0-14.9	40-60
	3	22	BLM	y	Low Severity Prescribed Fire	Hand, Fire	N	DF/G	10.0-14.9	40-60
168	2	1	BLM	y	Low Severity Prescribed Fire	Hand, Fire	N	DF	10.0-14.9	40-60
	3	1	BLM	y	Low Severity Prescribed Fire	Hand, Fire	N	DF	10.0-14.9	40-60
169	2	16	BLM	y	Low Severity Prescribed Fire	Hand, Fire	N	PP/G	10.0-14.9	<25
	3	16	BLM	Y	Low Severity Prescribed Fire	Hand, Fire	N	PP/G	10.0-14.9	<25
170	2	2	BLM	y	Low Severity Prescribed Fire	Hand, Fire	N	PP	10.0-14.9	<25
	3	2	BLM	Y	Low Severity Prescribed Fire	Hand, Fire	N	PP	10.0-14.9	<25
171	2	40	BLM	y	Improvement Harvest	Mech, Fire	N	DF	10.0-14.9	60+
	3	39	BLM	Y	Low Severity Prescribed Fire	Mech, Fire	N	DF	10.0-14.9	60+

Unit ID	Alternative (2/3)	Alternative Acres	MA/BLM	Wildland Urban Interface	Treatment Type	Treatment Method	IRA (J/L/N)	Dominant Species	Size Class (DBH)	Canopy Cover (%)
172	2	80	BLM	y	Improvement Harvest	Hand, Fire	N	DF	10.0-14.9	60+
	3		BLM	Y	Low Severity Prescribed Fire	Hand, Fire	N	DF	10.0-14.9	60+
173a	2	150	T1, T2, M1, L1	Y	Shaded Fuel Break	Mech, Hand, Fire	L	DF/LP	10.0-14.9	40-60
173b	2	643	T1, T2, M1, L1	Y	Low Severity Prescribed Fire	Mech, Hand, Fire	L	DF	10.0-14.9	60+
174	3	19	T1	y	Private Land Buffers	Mech, Hand, Fire	N	LP	5.0-9.9	60+
175	3	41	T1	y	Improvement Harvest	Mech, Fire	N	DF	10.0-14.9	60+
176	3	161	T1, T5	y	Low Severity Prescribed Fire	Hand, Fire	N	DF	15.0+	40-60
177	3	32	T1	y	Private Land Buffers	Mech, Hand, Fire	N	DF	10.0-14.9	60+
178a	3	203	M1, H1	y	Shaded Fuel Break	Hand, Fire	L	DF/LP/G	5.0-9.9	40-60
178b	3	207	H1	y	Mixed Severity Prescribed Fire	Hand, Fire	L	DF/LP	10.0-14.9	40-60
178c	3	133	H1	y	Low Severity Prescribed Fire	Hand, Fire	L	DF/LP	10.0-14.9	40-60
180	3	397	H1, H2	Y	Regeneration Harvest	Mech, Fire	N	LP	5.0-9.9	60+
181	3	209	H1, H2	Y	Low Severity Prescribed Fire	Mech, Hand, Fire	N	LP	5.0-9.9	60+
182	3	203	T1, T5, H2, L1	Y	Shaded Fuel Break	Hand, Fire	J	LP	5.0-9.9	60+
183	3	38	H2	Y	Private Land Buffers	Mech, Hand, Fire	J	LP	5.0-9.9	60+
184	3	55	H2	Y	Private Land Buffers	Mech, Hand, Fire	J	LP	5.0-9.9	60+
185	3	395	H1	N	Regeneration Harvest	Mech, Fire	N	LP	5.0-9.9	60+
186	3	67	R1, M1	y	Low Severity Prescribed Fire	Mech, Fire	N	DF	10.0-14.9	60+

APPENDIX B: FORESTWIDE STANDARDS, FOREST PLAN CONSISTENCY, AND MANAGEMENT AREA DIRECTION

This appendix contains two tables. The first table displays the forestwide standards and forest plan consistency as it relates to this project (Table 253). Appendices referenced in the ‘Standard’ column on the left refer to the appendices for the Helena National Forest Plan. The second table (Table 254) displays the management area direction for the project.

Table 253. Forestwide standards and forest plan consistency

Standard	If Standard applies, how is standard being met
Recreation	
1. New campgrounds and other developed recreation facilities, such as boat ramps or picnic areas, will generally not be constructed. Continue to maintain existing developed sites, but emphasize providing dispersed recreation opportunities. Removal of existing sites may be necessary, in some cases, due to site deterioration or excessive maintenance cost.	No new campgrounds or other developed recreation facilities are proposed with this project. Existing and developed campsites will be maintained in their existing condition. Please refer to the Recreation Specialist Report for more information regarding recreation facilities/sites.
2. Encourage ski-touring trail development by locating and marking additional trails and by encouraging the private sector to develop trails.	Not applicable to the purpose and need for the project because no existing or proposed ski trails are located in the project area.
3. Complete a Recreation Opportunity Guide (ROG) for each Ranger District, to make recreation opportunities more visible to the public.	A Forest ROG was developed years ago but is no longer maintained. Recreation opportunities are currently posted on the Forest website.
4. A specific Continental Divide National Scenic Trail (CDNST) route will not be identified prior to approval of the comprehensive plan being prepared by the Forest Service and the Secretary of Agriculture's Advisory Council. Once the comprehensive plan is approved, the management direction will be incorporated further in this plan. Based on the Comprehensive Plan, a more detailed analysis will be completed to show trail segments, objectives and specific route locations. The legislation authorizing the CDNST specifically intended that the trail would not adversely affect or preclude the application of normal management practices on lands adjacent to or within the trail corridor (both public and private). It is not the intent of the legislation that a separate "management plan" be developed for the CDNST, but to provide for the development and management of the trail as a management practice which is integrated into the overall prescription for the land through which the trail passes.	The Helena National Forest has not developed and incorporated into the Helena National Forest Plan specific management direction for the CDNST. The action alternatives would have a minimal short-term impact on non-motorized recreation opportunities in the area. The proposed treatments do not conflict with existing recreation direction. Project activities may disrupt some users of the trail during implementation; however, the length of this disruption would be short term.
5. Emphasize "Pack-In Pack-Out" use in dispersed recreation areas and in wilderness to reduce resource impacts and management costs.	Not applicable to the Tenmile South Helena Project, although, this is done via Frontline and recreation Forest personnel.
6. Provide information to users of remote areas and wilderness about potential conflicts with humans and bears and proper camping methods to avoid such conflicts.	Not applicable to the Tenmile South Helena Project, although, this is done via Frontline and recreation Forest personnel.

Standard	If Standard applies, how is standard being met
<p>7. Outfitter and guide use will generally be maintained at a level determined from the highest 2 years of actual use experienced during the period 1979 through 1983. Application for additional or new use will be considered on a case-by-case basis, with consideration of resource limitations and public need.</p>	<p>Not applicable to the Tenmile South Helena Project, because no outfitter and guide usage is proposed for consideration with this project.</p>
<p>Visuals</p> <p>1. A visual quality objective (VQO) is stated for each management area. These visual quality objectives provide the guidelines for altering the landscape. Portions of each management area may have a more or less restrictive VQO. Appendix B lists roads, trails, campgrounds, etc., that are within sensitive viewing areas. The VQO for these areas is noted in Appendix B. The VQO's for the Continental Divide National Scenic Trail will be the same as the Management Areas through which the trail passes.</p>	
	<p>The VQO for Management Areas T1 and L1 generally allow for maximum modification. The VQO for Management Areas H1, H2, L2, T3, and T5 generally allow for modification. The VQO for Management Areas M1, and R1 are retention. The VQO for Management Areas T4, W1, and W2 allows for partial retention.</p> <p>Colorado Gulch, Ten Mile Picnic Area, F.S. Road #4000 (Unionville), U.S. Highway 12, Interstate 15, Cromwell Dixon Campground, Moose Creek Campground, Park Lake Campground, Mt. Helena Recreation Trail, Continental Divide National Scenic Trail, and Orofino Gulch are all listed as Sensitivity Level 1 which calls for retention in the Foreground and partial retention in the Middle ground and Background.</p> <p>Implementation of both action alternatives would be consistent with the 1986 Helena National Forest Plan. By implementing the design criteria, VQOs for maximum modification, modification, partial retention, and retention would be met.</p> <p>Proposed landings, temporary roads, skyline corridors, and skid trails in areas with VQO's of retention and partial retention would meet VQO standards but not immediately upon implementation of activities. However, design criteria would minimize any short-term negative impacts and will result in long-term positive effects to the scenic quality of the project area.</p> <p>Forest-wide standards for Insects and Disease provide direction to use silvicultural systems to: (1) improve species diversity and growth, and vigor for stands, and (2) increase the size diversity and class diversity between stands. The management activities proposed in this project are tools to rehabilitate the vegetative condition within the project area. Several large stands of dead trees would be removed, providing an opportunity to improve the species diversity, growth and vigor of the vegetation and trending towards a more resilient landscape to disturbance such as insect and disease as well as wildfire. The Visual Management System identifies rehabilitation as a short-term management alternative. "Landscape rehabilitation is used to restore landscapes containing undesirable visual impacts to a desired visual quality. It may not always be possible to immediately achieve the prescribed visual</p>

Standard	If Standard applies, how is standard being met
	<p>quality objective with rehabilitation, but should provide a more visually desirable landscape in the interim" (USDA, 1974).</p> <p>The potential direct, indirect, and cumulative effects of the proposed activities to visual resources would be consistent with forest plan direction for visual resources because the application of the landscape rehabilitation management alternative as outlined in the VMS would allow a longer period of time for the retention VQO to be achieved.</p> <p>The purpose of proposed activities in the Tenmile – South Helena project are impart aimed at reducing the risk of post wildfire effects on the landscape and creating vegetation conditions that are more resilient to disturbance such as insect and disease as well as wildfire.</p>
Cultural Resources	

Standard	If Standard applies, how is standard being met
<p>1. The Forest will undertake a systematic program of cultural resource inventory, evaluation, and preservation aimed at the enhancement and protection of significant cultural resource values, as prescribed for Federal Agencies by Section 106 of the National Historic Preservation Act and 36 CFR 800. Cultural resource sites evaluated as significant will be preserved in place whenever possible. When such resources are threatened by project development, an effort to avoid or minimize adverse impact by project redesign will be made. When avoidance is judged by the Forest Supervisor to be imprudent or infeasible, the values of the site will be conserved through proper scientific excavation, recordation, analysis, and reporting. An inventory survey for cultural resources will be made for all significant ground-disturbing activities. Forest inventory efforts will be focused in three areas including: a. Areas where specific project activities, such as timber sales, road developments, range improvements, or mineral development activities, result in significant ground disturbance. b. Large areas where substantial development impact is anticipated, such as oil- and gas-planning areas. c. Areas where formal archaeological surveys may provide management data that are broadly applicable to ecologically similar areas and which will facilitate the development of predictive models capable of addressing issues of cultural site density, distribution, and significance. The Forest will encourage scientific research by privately funded universities as a means of acquiring additional inventory and interpretive data. Such projects will be coordinated with the State Historic Preservation Officer and the Advisory Council on Historic Preservation. Cultural resource site information is exempt from disclosure under the Freedom of Information Act. Following Forest Supervisor written approval, site location data may be released on a need-to-know basis to consultants, universities, or museums. Discovered cultural resources will be evaluated in relation to published Advisory Council on Historic Preservation (ACHP) criteria for eligibility to the National Register of Historic Places. Cultural resource sites determined eligible will be nominated to the National Register. The Forest will coordinate cultural resource issues and concerns with the appropriate Native American groups to ensure that Forest management activities are not detrimental to the protection and preservation of Native American religious and cultural sites, treaty rights, and religious and cultural practices. The Forest will enhance and interpret significant cultural sites for the education and enjoyment of the public when such development will not degrade the cultural property or conflict with other resource considerations. Known significant cultural resource sites on the Forest will be protected from inadvertent or intentional damage or destruction. Portions of the Lewis and Clark National Historic Trail are on the Helena Forest. Some interpretive signing has been placed along the trail. Normal management practices can still access land adjacent to or within the trail corridor, however, project activities will be conducted to minimize disturbance to the cultural site.</p>	<p>The Forest Plan requires the integration of cultural resources in project planning and forest management. Compliance inventory, evaluation of site significance and project effect, consultation with the Montana State Historic Preservation Office and Tribal Historic Preservation Officers, and implementation of design features for project-affected cultural resources would comply with the National Historic Preservation Act and its implementing regulations in 36 CFR 800, as well as Helena National Forest Plan (USDA 1986) standards and guidelines. Therefore, the results of this project on cultural resources will remain within Forest Plan standards because NHPA Section 106 will be completed prior to implementation and mitigation will be done to avoid adversely affecting cultural resources within the planning area. This standard is met.</p>
Wildlife and Fish Indicator Species	
<p>1. Populations of wildlife "indicator species" will be monitored to measure the effect of management activities on representative wildlife habitats with the objective of ensuring that viable populations of existing native and desirable non-native plant and animal</p>	<p>Westslope cutthroat trout (WCT) are an indicator species. The Tenmile - South Helena Project Fisheries Specialist Report and Biological Evaluation analyzed and measured potential effects of</p>

Standard	If Standard applies, how is standard being met
<p>species are maintained. See Chapter IV, part D Monitoring and Evaluation for specific monitoring requirements. Indicator species have been identified for those species groups whose habitat is most likely to be changed by Forest management activities. The mature tree dependent group indicator species is the marten; the old growth dependent group is represented by the pileated woodpecker and the goshawks; the snag dependent species group is represented by the hairy woodpecker; the threatened and endangered species include grizzly bear, gray wolf, bald eagle and peregrine falcon; commonly hunted indicator species are elk, mule deer and bighorn sheep; fish indicator species is the cutthroat trout.</p>	<p>the project on this indicator species. However, WCT are not known to be present in any streams in the project area.</p> <p>Monitoring element C7 focuses on pileated woodpeckers, among other species. Pileated woodpeckers were chosen as a management indicator species (MIS) because they were the largest primary excavator on the Helena National Forest. Pileated woodpeckers were also chosen as an MIS species because they have the most restrictive requirements in terms of snag size of any cavity nester on the Forest. Forest Plan Standards applicable to pileated woodpeckers are those that provide thresholds for snags. Out-year monitoring would occur in the project as part of Forest Plan monitoring specific to element C7.</p> <p>Monitoring element C7 focuses on northern goshawks, among other species. The northern goshawk was chosen as an MIS species for old growth due to the diverse prey base and nesting habitat commonly found in late-successional forests. Dispersion of late-successional habitat throughout the Forest was considered important for goshawks although recent science has shown that goshawks also make use of a wide variety of habitats so long as a diverse prey base is present along with mature trees for nesting. Out-year monitoring would occur in the project as part of Forest Plan monitoring specific to element C7.</p> <p>Monitoring element C7 focuses on hairy woodpeckers, among other species. Hairy woodpeckers have wide ecological amplitude in terms of nesting and foraging. Hairy woodpeckers are abundant across the Forest. Forest Plan Standards applicable to hairy woodpeckers are those that provide thresholds for snags. Out-year monitoring would occur in the project as part of Forest Plan monitoring specific to element C7.</p> <p>Monitoring element C8 focuses on martens. Martens were chosen as a management indicator species (MIS) because they are associated with mesic mature and late-successional forests. Specifically, they require at least 25% canopy cover and generally avoid large openings. Consequently, they are sensitive to management actions. Furthermore, because they are predators they are good indicators of ecosystem health due to their position on the food chain. According to the Forest Plan EIS, Appendix B (p. B/68), old growth requirements of the Forest Plan are intended to</p>

Standard	If Standard applies, how is standard being met
	provide the minimum management requirements for several species including martens. Forest Plan Standards applicable to martens are those that provide thresholds for snags. Out-year monitoring would occur in the project as part of Forest Plan monitoring specific to element C8.
Big Game	
Big Game 1. On important summer and winter range, adequate thermal and hiding cover will be maintained to support the habitat potential.	Thermal cover will be removed on elk winter range in order to meet the purpose and need of the project. A site specific exemption to the standard would be required for either action alternative. Because this thermal cover will be lost by natural means in the next decade or so and because Alternatives 2 and 3 are not expected to otherwise negatively impact the elk population in HD 215 and HD 335, an exemption to the standard would be in order.
2. An environmental analysis for project work will include a cover analysis. The cover analysis should be done on a drainage or elk herd unit basis. (See Montana Cooperative Elk-Logging Study in Appendix C for recommendations and research findings on how to maintain adequate cover during project work.)	This standard is met. The cover analysis is completed at the elk herd unit scale. There are three herd units that overlap the project area: Jericho, Black Mountain – Brooklyn Bridge and Quartz herd units. Elk herd units were developed with Montana Department of Fish, Wildlife, and Parks. Refer to the Wildlife Specialist Report.
3. Subject to hydrologic and other resource constraints, elk summer range will be maintained at 35 percent or greater hiding cover and areas of winter range will be maintained at 25 percent or greater thermal cover in drainages or elk herd units.	<p>Big game standard 3 (HFP, p. II/17) requires that hiding cover on elk summer range be maintained at or above 35 percent (or, on in this case, 50 percent crown closure using the MFWP criterion). Hiding cover must be in blocks of at least 40 acres to be tallied as Forest Plan hiding cover. Both action alternatives would result in the reduction of hiding cover but not to the extent that the affected herd units would fall out of compliance.</p> <p>Standard 3 also requires that thermal cover on winter range be maintained at or about 25 percent in blocks of at least 15 acres. Under Alternative 1, only the Jericho herd unit meets the thermal portion of this standard (currently at 25%), while the Black Mountain – Brooklyn Bridge and Quartz herd units do not (17% and 16%, respectively). Alternatives 2 and 3 would further reduce thermal cover on winter range in all three EHUs and reduce the winter range thermal cover such that all EHUs would be out of compliance with standard 3, thermal cover. Thus, a site-specific exemption to the standard would be required for either action alternative. Because this thermal cover will be lost by natural means in the next decade or so and because Alternatives 2 and 3 are not expected to otherwise negatively impact the elk population in HD 215 and HD 335, an exemption to the standard would be in order.</p>

Standard	If Standard applies, how is standard being met																		
<p>4. Implement an aggressive road management program to maintain or improve big game security. To decide which roads, trails, and areas should be restricted and opened, the Forest will use the following guidelines developed with the Montana Department of Fish, Wildlife, and Parks (MDFWP). The Forest visitor map will document the road management program.</p> <p>4a. Road management will be implemented to at least maintain big game habitat capability and hunting opportunity. To provide for a first week bull elk harvest that does not exceed 40 percent of the total bull harvest, roads will be managed during the general big game hunting season to maintain open road densities with the following limits.</p> <table><tr><th>Existing Percent Hiding cover (according to FS definition of hiding cover) (1)</th><th>Existing Percent Hiding Cover (according to MDFWP definition of hiding cover) (2)</th><th>Max Open Road Density</th></tr><tr><td>56</td><td>80</td><td>2.4 mi/mi (2)</td></tr><tr><td>49</td><td>70</td><td>1.9 mi/mi (2)</td></tr><tr><td>42</td><td>60</td><td>1.2 mi/mi (2)</td></tr><tr><td>35</td><td>50</td><td>0.1 mi/mi (2)</td></tr><tr><td>(1) A timber stand which conceals 90 percent or more of a standing elk at 200 feet.</td><td>(2) A stand of coniferous trees having a crown closure of greater than 40 percent.</td><td></td></tr></table> <p>The existing hiding cover to open road density ratio should be determined over a large geographic area, such as a timber sale analysis area, a third order drainage, or an elk herd unit.</p>	Existing Percent Hiding cover (according to FS definition of hiding cover) (1)	Existing Percent Hiding Cover (according to MDFWP definition of hiding cover) (2)	Max Open Road Density	56	80	2.4 mi/mi (2)	49	70	1.9 mi/mi (2)	42	60	1.2 mi/mi (2)	35	50	0.1 mi/mi (2)	(1) A timber stand which conceals 90 percent or more of a standing elk at 200 feet.	(2) A stand of coniferous trees having a crown closure of greater than 40 percent.		<p>Big game standard 4(a) (HFP, p. II/17-18) requires implementation of an aggressive road management program to maintain or improve big game security (habitat capability and hunting opportunity). This standard is not met under the no action alternative in the Quartz EHU, and is met for the other EHUs. Under Alternative 2, none of the EHUs would meet this standard. Under Alternative 3, only the Jericho EHU would meet the standard. The cause is not road density increases necessarily, but a lack of hiding cover. The project would decrease cover immediately, whereas Alternative 1 would allow it to occur naturally. A site-specific exemption to the standard would be required for either action alternative.</p>
Existing Percent Hiding cover (according to FS definition of hiding cover) (1)	Existing Percent Hiding Cover (according to MDFWP definition of hiding cover) (2)	Max Open Road Density																	
56	80	2.4 mi/mi (2)																	
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(1) A timber stand which conceals 90 percent or more of a standing elk at 200 feet.	(2) A stand of coniferous trees having a crown closure of greater than 40 percent.																		

Standard	If Standard applies, how is standard being met
4b. Elk calving grounds and nursery areas will be closed to motorized vehicles during peak use by elk. Calving is usually in late May through mid-June and nursery areas are used in late June through July.	Forest Plan standard 4(b) requires that elk calving grounds and nursery areas be closed to motorized vehicles during peak use by elk. This is usually from late May through July. While the project area has not been mapped by MFWP or the Helena NF as a calving ground/nursery area, some calving probably occurs around the meadows and heads of drainages in the project area. Elk with calves probably remain in the general area during the nursing period. A number of roads in and around the project area have been open to public vehicles for several decades without problems for calf production and survival. The temporary roads planned for the project would not be open to public use. Project operations would not occur during the calving season if calving areas have been identified. If nursery sites are discovered during the course of the project, operations would be modified to avoid the sensitive areas. Both action alternatives would be consistent with this standard.
4c. All winter range areas will be closed to vehicles between December 1 and May 15. Exceptions (i.e., access through the winter range to facilitate land management or public use activities on other lands) may be granted.	Forest Plan standard 4(c) (HFP, p. II/18) requires that all winter ranges will be closed to vehicles between December 1 and May 15. Both action alternatives include treatments during the winter in winter range. A site-specific exemption to the standard would be required for either action alternative.
4d. At restricted roads, trails, and areas, signs will be posted which tell: 1. Type of restriction. 2. Reason for restriction. 3. Time period of restriction. 4. Cooperating agencies.	This standard is met. All restricted roads, trails, and areas are posted and continually reposted with this information. All roads that are constructed as a part of the project will be posted with the appropriate restriction.
4e. Roads that will be closed will be signed during construction or reconstruction telling the closure date and the reason for closure.	Some roads will be closed temporarily during removal of fuel to provide for safety of the public and crews. These roads will be signed and will provide the dates and reason for closure.
4f. Enforcement is a shared responsibility. Enforcement needs will be coordinated with the MFWP.	This standard is met as enforcement is coordinated with MFWP.
4g. Opened Forest roads will normally have a designed speed of less than 15 miles per hour. Exact design speeds will be determined through project planning. Loop roads are not recommended and will be avoided in most cases.	This standard is met. No loop roads are proposed with this project.
4h. The Forest Road Management Program will be developed in conjunction with MFWP and interested groups or individuals. The Road Management Program will contain the specific seasonal and yearlong road, trail, and area restrictions and will be based on the goals and objectives of the management areas in Chapter III of the Forest Plan.	This standard does not apply because the Tenmile – South Helena project does not propose any changes to the current Forest's road management program.

Standard	If Standard applies, how is standard being met
4i. Representatives from the Helena Forest and MDFWP will meet annually to review the existing Travel Plan.	This standard is not applicable because the Tenmile – South Helena project does not propose any travel management changes. Annual meetings with MDFWP is out of the scope of this project, however, roads within the project area along with other forest roads will be reviewed annually with MDFWP.
5. On elk summer range the minimum size area for hiding cover will be 40 acres and the minimum size area on winter range for thermal cover will be 15 acres.	Thermal and hiding cover have been modeled according to the Criteria for Wildlife Models Helena National Forest that specifies patch size as 40 acres for hiding cover and 15 acres for thermal cover.
6. Montana Cooperative Elk-Logging Study Recommendations, in Appendix C, will be followed during timber sale and road construction projects.	<p>Forest Plan standard 6 (Forest Plan II/19 and C/1 -11) requires that the recommendations embodied in the Montana Cooperative Elk-Logging study (Appendix C of the Forest Plan) be followed during timber sale and road construction projects. There are a total of eleven recommendations some of which have been incorporated as design elements as previously described. The following discussion describes the project's consistency with each of the eleven recommendations.</p> <p>Security during logging operations – The action alternatives are consistent with this recommendation. Design elements have been incorporated that confine logging to a single drainage at a time to minimize disturbance to elk. Also, logging activities will be completed in the shortest time frame possible. Use of firearms will be prohibited for anyone working within an area closed to the general public.</p> <p>Redistribution of elk – The action alternatives are consistent with this recommendation which requires that timber sales be planned in a manner that does not redistribute elk onto adjacent or nearby property. Management challenges associated with HDs 215 and 335 do include redistribution of elk to private land (MFWP 2005a, pp. 190-193). The redistribution of elk that is currently occurring in HDs 215 and 335 would not be exacerbated by the action alternatives because design criteria would provide cover habitat in alternate drainages, for example.</p> <p>Traditional home range use by elk – This recommendation is intended to ensure that timber harvest and road construction are planned to minimize impacts to elk and elk hunting. The action alternatives are consistent with this recommendation since all temporary roads will be closed to the public during logging operations and decommissioned post-implementation.</p> <p>Road construction and design – This recommendation is intended to maintain the integrity of elk movement patterns and provide security for unimpeded movement. The action alternatives are</p>

Standard	If Standard applies, how is standard being met
	<p>consistent with this recommendation in so far as security either remains the same post-implementation, and all temporary roads will be closed to the public during implementation and decommissioned afterwards. There may be some temporary disruption to traditional movement patterns; however, ample blocks of unroaded areas exist that will provide alternative travel ways. Furthermore, there would be minor beneficial impacts from the proposed road segment closures associated with the project.</p> <p>Road management – This recommendation is also intended to maintain elk security through management of road densities. Implementation of the action alternatives does not affect open road placement.</p> <p>Area closures during the hunting season – This recommendation is intended to ensure that travel restrictions are carefully considered relative to elk management objectives so that hunting opportunities aren't unnecessarily impacted. This recommendation is not applicable to the Tenmile South Helena project.</p> <p>Clearcuts – This recommendation is intended to ensure that forage produced through clear-cutting is available to elk. The action alternatives are consistent with these considerations since slash clean up inside clearcuts would be reduced to less than 1.5 feet and all temporary roads will be closed to the public. Openings would be generally less than 100 acres. However, there are several larger units proposed, including some that are adjacent to one another thus creating even larger openings. A site-specific amendment would be required for either action alternative.</p> <p>Cover type – This recommendation is intended to ensure that cover types, important to elk, are considered during planning and implementation of silvicultural practices. The action alternatives are consistent with this recommendation since cover type data are available Forestwide (via R1-VMap) and have been utilized for the Tenmile South Helena project to identify cover and forage.</p> <p>Moist sites – This recommendation is intended to ensure that the integrity of moist sites is maintained since these areas comprise important components of elk habitat. Design elements have been developed to retain green trees, standing snags, and coarse woody debris in and around the fringes of those sites that occur in treatment units. [see "Mitigation/Design Elements"]</p>

Standard	If Standard applies, how is standard being met
	<p>toward the end of this report]. This should preserve their utility for elk and other wide-ranging species as well as for smaller resident mammals, birds, and amphibians.</p> <p>Elk/cattle relationships – This recommendation is intended to ensure that forage created as a result of timber harvest remain available to elk. The action alternatives are consistent with this recommendation since cattle and elk currently congregate where they overlap.</p> <p>Winter range – This recommendation states that timbered areas adjacent to primary winter foraging areas should be managed to maintain the integrity of cover and that timber harvest should be scheduled outside of the winter period. Both action alternatives include treatments during the winter in winter range. A site-specific exemption to the standard would be required for either action alternative.</p>
7. Inventorying and mapping important big game summer/fall and winter ranges will continue.	The Helena National Forest Wildlife Staff will continue to work with MTFWP area biologist to update our big game range maps. Inventory is ongoing as part of project-level analyses.
8. Any proposed sagebrush reduction programs will be analyzed on a case-by-case basis for the possible impact on big game winter range.	This standard does not apply. The Tenmile – South Helena project is not proposing any sagebrush reduction programs.
9. Occupied bighorn sheep and mountain goat range will be protected during resource activities. Project plans for livestock, timber, or other resource development will include stipulations to avoid or mitigate impacts on their range. Conflicts between livestock and these wildlife species will be resolved in favor of the big game.	This standard does not apply to the Tenmile – South Helena project as bighorn sheep and mountain goats are not present in the project area.
10. Moose habitat will be managed to provide adequate browse species diversity and quantity to support current moose populations.	Effects to moose are addressed through the discussion on effects to Riparian habitat. Treatments that mimic disturbance processes (as in the case of this project) in wetlands and riparian zones are important in maintaining species richness and diversity, both plants and animals.
Threatened and Endangered (T&E) Species	

Standard	If Standard applies, how is standard being met
<p>1. A biological evaluation will be written for all projects that have potential to impact any T&E species or its habitat. All evaluations will address each projects potential to adversely modify a listed species habitat or behavior. If an adverse impact is determined, mitigation measures will be developed to avoid any adverse modification of a listed species habitat or behavior. If all possible mitigation measures do not result in a no effect determination, then informal and/or formal consultation with the U.S. Fish and Wildlife Service will be initiated.</p>	<p>A biological evaluation will be prepared for this project to assess impacts to both aquatic and terrestrial T&E species. Since mitigation measures do not result in a “no effect” determination, informal and/or formal consultation with the U.S. Fish and Wildlife Service will be initiated.</p> <p>The biological evaluation of terrestrial wildlife species for the Tenmile – South Helena project occurs throughout the body of the wildlife report wherever the different species of concern are addressed. These include in detail 2 threatened species (lynx and grizzly bear) and one sensitive species (wolverine). Other sensitive species are discussed in the “Topics not Analyzed in Detail” section of the Wildlife Specialist Report.</p> <p>No Threatened or Endangered Species are known or suspected in the project area.</p>

Standard	If Standard applies, how is standard being met
<p>2. Grizzly bear -- Apply the guidelines in Appendix D to the Management Situation 1 and 2 (referred to essential and occupied prior to 1984) grizzly bear habitat on the Forest (see map in Appendix D).</p> <p>Initiate field studies in undesignated areas known to be used by grizzlies, to determine if the areas should be designated as grizzly habitat. Until sufficient evidence is available to determine the status of these areas, manage them according to Appendix E, Grizzly Management Guidelines Outside of Recovery Areas.</p>	<p>The project area is not in Management Situation 1 and 2. Therefore, this part of the standard does not apply to the Tenmile – South Helena project.</p> <p>At this time, the size of the local grizzly population is unknown and its status uncertain. All that can be said, based on field observations to this point, is the following:</p> <ul style="list-style-type: none"> ○ Population density is very low (only 5 verified occurrences in the general area 2004-2012—although several additional observations are highly credible). ○ Reproduction is uncommon (4 reports of a sow with cubs since 1991). ○ The stability and persistence of the current population may be tenuous (since the presence of grizzlies may be indicative of a linkage zone with transient individuals rather than an incipient Biological Activity Center) (HFP, Appendix E). <p>South of U.S. Highway 12, most observations have come from the upper reaches of the Little Blackfoot watershed and along the border between the Helena NF and the Beaverhead-Deerlodge NF (including the upper Cataract and Basin Creek drainages just to the south). The number of credible grizzly bear reports in these areas has been increasing in recent years as the population in the NCDE expands to the point that more bears are exploring new territory further to the south (J. Jonkel, personal communication, 2007). Be that as it may, recent monitoring efforts designed to identify individual grizzlies through DNA analysis of hair samples collected from rub trees (2009-2010) have yet to turn up any sign of the bears south of Highway 12—a further indication of their scarcity in this area.</p> <p>At this time, the project area is not considered a biological activity center (BAC) because the following criteria for BAC have not been met: Observations [of grizzly bears] must include females with cubs or yearlings at least 5 or the 10 years.</p>
<p>3. In occupied grizzly habitat, to minimize man-caused mortality the open road density will not exceed the 1980 density of 0.55 miles per square mile, which was determined to have little effect on habitat capability.</p>	<p>This standard does not apply to the Tenmile – South Helena Project because the project area is outside occupied grizzly bear habitat as defined in the Helena National Forest Plan appendix D.</p>

Standard	If Standard applies, how is standard being met
4. Research activity on grizzly bears or their habitat will be reviewed by the Research Subcommittee of the Interagency Grizzly Bear Committee.	This standard does not apply to the Tenmile – South Helena project. The project area is outside grizzly bear recovery zone and mapped grizzly bear distribution zone.
5. Bald Eagle and Peregrine Falcon -- Continue working with the MDFWP, the USFWS, and the BLM to identify nesting and wintering areas. Identify nesting territories and roosting sites, and protect both from adverse habitat alteration. (Guidelines for how to identify bald eagle habitat are in the Wildlife Planning Records.) Powerlines constructed within bald eagle or peregrine falcon habitat will be designed to protect raptors from electrocution. See Appendix D for bald eagle and peregrine falcon habitat maps.	<p>This standard is met because there are no known bald eagles and peregrine falcons nesting territories and/or roosting sites in the project area.</p> <p>Falcon eyries are located on high cliffs, often near water. Peregrine falcons were extirpated from the Divide landscape in the mid-20th century, and no new occupied eyries have been located in the landscape since the falcons have become re-established in and around the Helena NF (almost entirely in the Big Belt Range) in the early 1990s.</p> <p>No active bald eagle nests have been located on HNF lands in the Divide landscape since the rejuvenation of local eagle populations over the last 3 decades. All known nests near the landscape are in the Little Blackfoot drainage on private land to the west. Most resident eagles on the Forest are located along the Missouri River in the Big Belt Range and along the Big Blackfoot River.</p>
6. Gray Wolf -- With the USFWS and MDFWP, investigate reported gray wolf observations to confirm or deny gray wolf presence. If presence of gray wolf is confirmed, determine if the habitat is necessary for the wolf's recovery. If the habitat is necessary, coordinate with the MDFWP and the USFWS to implement the Wolf Recovery Plan. See Appendix D for gray wolf habitat map.	Wolves have recently been delisted based on achievements of recovery goals. Wolves may occur in the project area and are analyzed in the Wildlife Specialist Report. This standard is not applicable because the wolf has been recovered.
7. No known threatened or endangered plants are on the Helena National Forest.	This standard is met. No threatened and endangered species are known or suspected in the project area.

Standard	If Standard applies, how is standard being met
<p>8. Species of Special Concern</p> <p>There are habitats on the Forest where the following species of special concern may be found (Plant Species of Special Concern, USDA-FS, 1980) Lemhi penstemon (<i>Penstemon lemhiensis</i>), Howell's gumweed (<i>Grindelia howellii</i>), Missoula phlox (<i>Phlox missoulensis</i>), Cliff toothwort (<i>Cardamine rupicola</i>). Missoula phlox and cliff toothwort have been located on the Helena Forest.</p> <p>Other Plants that are termed rare have also been located on the Helena Forest. They are Klaus' bladderpod (<i>Lesquerella plausii</i>) and Long-styled thistle (<i>Cirsium longistylum</i>). Two additional rare plants, Moschatel (<i>Adoxa moschalellina</i>) and Lesser rush milkvetch (<i>Astragalus connvallarius</i>) are believed to occur on the Helena Forest but currently have no occurrence records.</p> <p>If any of these species are verified on the Helena Forest, appropriate measures, pursuant to Section 7 of the Endangered Species Act, will be taken.</p>	<p>The Forest Plan direction for sensitive plants (USDA 1986, II/20) refers to the Endangered Species Act and pertains only to listed species, none of which occur on the Helena National Forest. Therefore, this direction is not applicable at this time. Subsequent guidance from the Regional Office provides direction regarding sensitive plants and their habitats with which the project as proposed is consistent.</p>
<p>Old Growth</p> <p>An old growth stand is generally characterized by a high level of standing and down, dead and rotting woody material; two or more levels of tree canopies and a high degree of decadence indicated by heart rot, mistletoe, dead or broken tree tops, and moss. Five percent of each third order drainage should be managed for old growth. The priority for old growth acres within each drainage is: first, land below 6000 feet in elevation; second, riparian zones and mesic drainage heads; and third, management areas emphasizing wildlife habitat. These areas will normally be managed on a 240 year rotation and will range from 10 acres to several hundred acres.</p> <p>Management areas other than T-1 through T-5 will be the primary source for old growth. However, if adequate old growth area cannot be achieved then the T management areas will be considered to meet old growth objectives.</p>	<p>This standard applies and is being met with all Alternatives. Approximately 5 percent of each of the third order drainages associated with the project have been designated for old growth management. The designation protocol included consideration of all the priority criteria listed by this standard. No old growth would be treated with the action alternatives. Refer to the project's Forest Vegetation and the project file for more detailed information (USDA 2012c).</p>
<p>Snags</p> <p>1. To keep an adequate snag resource (standing dead trees) through the planning horizon, snags should be managed at 70 percent of optimum (average of 2 snags/acre) within each third order drainage.</p> <p>2. Snag management guidelines need not be applied within a quarter mile of riparian areas, because riparian standards should provide for adequate snags.</p> <p>3. Larch, ponderosa pine, Douglas-fir, spruce, and subalpine fir, in that priority, are the preferred species for snags and replacement trees (live trees left to replace existing snags).</p>	<p>This standard applies and is met with all alternatives. There would be snags well in excess of this level in each third order drainage. See the Forested Vegetation Report.</p> <p>This standard applies and is being met because riparian standards are being followed with all alternatives.</p> <p>This standard applies and is met. Lodgepole is not specified as a desirable snag species but would account for the majority of snags. Other species are present as well such as Douglas-fir, ponderosa pine, and subalpine fir. See the Forest Vegetation Report.</p>

Standard	If Standard applies, how is standard being met
<p>4. Management areas other than T-1 should be the primary source for snag management. However, if adequate snags cannot be found outside of T-1, then the following numbers and sizes of snags should be retained in cutting units, if available.</p> <p>A. In units with snags, keep a minimum of 20 snags and 10 replacement trees per 10 acres, if available. If 20 snags are not available, then any combination totaling 30 should be left, by the following dbh classes:</p> <ul style="list-style-type: none"> 13 snags and 6 replacement trees from 7-11 inches 5 snags and 3 replacement trees from 12-19 inches 2 snags and 1 replacement trees 20+ inches <p>B. In units--except those of pure lodgepole--without snags keep a minimum of 30 wind firm trees per 10 acres, if available, by the following dbh classes:</p> <ul style="list-style-type: none"> 21 trees from 7-11 inches 7 trees from 12-19 inches 2 trees from 20+ inches <p>If wildlife funds are available, a third of the replacement trees should be girdled or otherwise killed to provide snags, by the following dbh classes:</p> <ul style="list-style-type: none"> 7 trees from 7-11 inches dbh 2 trees from 12-19 inches dbh 1 tree from 20+ inches dbh 	<p>This standard applies and is being met with all Alternatives. No snags would be cut under the No Action with the exception of ongoing public firewood gathering. Snags are available across multiple management areas in the project area. In the Proposed Action, snags are primarily provided for outside of treatment units, although snag retention guidelines are prescribed. Also, replacement snags would be provided by green trees of species other than lodgepole that would be retained to the extent possible in regeneration harvest units; and to the desired density of generally the largest and healthiest trees available in improvement harvest units. Refer to the Forested Vegetation Report.</p>
Fisheries	
<p>1. Maintain quality water and habitat for fish by coordinating Forest activities and by direct habitat improvement (see Forest Wide Standards for riparian).</p>	<p>Sediment impacts to fisheries under the action alternatives analyzed for this project would be up to 5 years and would be partly offset through mitigations (road improvements, culvert replacement, road decommissioning, and wetland restoration). A summary of project impacts is discussed in the Fisheries Specialist Report and Biological Evaluation.</p>
<p>2. Instream activities should allow for maximum protection of spring and fall spawning habitats.</p>	<p>Standard would be met. Instream structures would be limited to existing culvert replacement. No new culverts will be installed as part of this project except where damaged or undersized culverts are proposed for replacement or upgrade resulting in a long-term benefit to fishery resources. BMPs would be in place to minimize impacts to and fish bearing habitat. A summary of design criteria and mitigation measures are included in the Assumptions section of the Fisheries Specialist Report and Biological Evaluation.</p>

Standard	If Standard applies, how is standard being met
3. Structures installed within streams supporting fisheries will be designed to allow upstream fish movement, especially to spawning areas.	Standard would be met. Instream structures would be limited to existing culvert replacement. No new culverts will be installed as part of this project except where damaged or undersized culverts are proposed for replacement or upgrade resulting in a long-term benefit to fishery resources. BMPs would be in place to minimize impacts to and fish bearing habitat. A summary of design criteria and mitigation measures are included in the Assumptions section of the Fisheries Specialist Report and Biological Evaluation.
Range	
1. Riparian condition within livestock allotments will be mapped and become part of the Allotment Management Plan.	Standard does not apply to the Tenmile-South Helena project.
2. Where analysis shows range resource damage, the cause will be identified and corrective action will be initiated through an allotment management plan.	Standard does not apply to the Tenmile-South Helena project.
3. Chemical spraying should not be used on sagebrush control projects if other control methods are feasible.	Standard is being met. No chemical control of sagebrush is planned for the Tenmile-South Helena project.
4. Best Management Practices (BMPs) will be used to minimize livestock damage to lakeside soils, stream sides, and other fragile areas.	Standard does not apply to the Tenmile-South Helena project.
5. Allotment management plans will specify the utilization standards of key plant species needed to protect the soil and water quality. Allowable forage utilization of these plants should be based on local range conditions, soil stability, and known individual plant requirements. The guides for allowable utilization of key species, by condition classes, are in the Range Management Handbook (FSH 2209.21).	Standard does not apply to the Tenmile-South Helena project.
6. Allotment Management Plans will be developed using the interdisciplinary process.	Standard does not apply to the Tenmile-South Helena project.
Noxious Weeds	
1. Implement an integrated weed control program in cooperation with the state of Montana and County Weed Boards to confine present infestations and prevent establishing new areas of noxious weeds. Noxious weeds are listed in the Montana Weed Law and designated by County Weed Boards.	This project incorporates the Helena National Forest Weed Control program. The Helena National Forest Noxious Weed Vegetation Treatment Environmental Impact Statement (USDA Forest Service 2006b) is part of the project file. Addressed by unit and species in design criteria and mitigations.
2. Integrated Pest Management, which uses chemical, biological, and mechanical methods, will be the principal control method. Spot herbicide treatment of identified weeds will be emphasized. Biological control methods will be considered as they become available.	This analysis considers integrated pest management with the estimates of weed spread and control. The Helena National Forest Noxious Weed Vegetation Treatment Environmental Impact Statement (USDA Forest Service 2006b) is part of the project file.
3. Funding for weed control on disturbed sites will be provided by the resource which causes the disturbance.	This standard does not apply to the Tenmile – South Helena project.
Revegetation	

Standard	If Standard applies, how is standard being met
1. Seeding will be done in a timely manner on disturbed areas, to prevent erosion and to achieve best revegetation results.	Re-vegetation is built into the project as project design features.
2. Seeding mixtures of native plants (naturally occurring) should be used, if practical, in all revegetation projects greater than two acres. On smaller disturbances, the responsible official may authorize the use of exotic species.	Recommended certified weed seed free native seed mixtures are included.
3. Seeding guidelines, based on elevation, soil type, parent material, habitat type, and reasonable cost, are listed in Appendix F.	Recommended certified weed seed free native seed mixtures that meet the seeding guidelines are included.
Timber	
1. Silvicultural examinations and prescriptions will be required before any timber manipulation or silvicultural treatment takes place. Exceptions include cutting of trees that block vision along roads, cutting hazard trees, clearing right-of-way, clearing for mineral development, minor and incidental amounts of free use, and cutting personal firewood. Final determination of what silvicultural system will be used for a particular project will be made by a certified silviculturist after an on-the-ground site analysis. This site specific analysis will determine the appropriate even or un-even age silvicultural system that best meets the goals and objectives of the management area. Standards for applying all silvicultural systems, as well as supporting research references are in the Northern Region guide (June 10, 1983). In addition, broad guidelines are found in Appendix H and M. Even aged management methods will be used only where it is determined to be appropriate to meet objectives. Clearcutting will be used only where it is the optimum method.	<p>Silvicultural prescriptions would be prepared prior to any stand manipulation. These will be informed by the examination methods described on pages 10 and 11 of the Forested Vegetation Specialist Report (Gump 2015) and in the Forested Vegetation section of Chapter III</p> <p>Even aged management would be used only where appropriate to meeting project objectives and clearcutting would only be used where it is the optimal method for regenerating the stand as documented in the Silvicultural Prescriptions.</p>
2. Tree improvement will be conducted in accordance with the current Regional and Forest level tree improvement plans.	Standard does not apply. There is no tree improvement activities proposed as part of this project.
3. Transportation plans and logging systems must be designed jointly to provide for long-term stand management, with full consideration given to topography and slope, the overall economic efficiency of roading and yarding costs, and the needs of other resources.	This has been completed as part of the design of the proposed action and subsequent action alternatives. It is located in the project record.
4. Timber stand openings created by even-aged silvicultural systems will normally be 40 acres or less. Creation of larger openings will require a 60-day public review and Regional Forester approval. Exceptions are listed in the Northern Regional Guide.	The standard does not apply to the No Action Alternative, but does apply and is met by the Action Alternatives. Openings over 40 acres would be created but exceptions to the Regional Forester approval process apply due to insect-caused mortality. Refer to Forested Vegetation Specialist Report.

Standard	If Standard applies, how is standard being met
<p>5. A feasibility analysis of each sale over one million board feet will be made to assure that it has been designed with the most cost-effective measure possible in keeping with environmental concerns. This analysis will examine strategic items in the sale design process to assure consideration of economic impacts of these items on the sale value. A cash flow analysis will be done to determine the viability of the sale with current market conditions. If anticipated costs are higher than predicted high bids, consider the following:</p> <ul style="list-style-type: none"> a. Defer the sale until economic conditions would indicate receiving higher bids. b. Proceed to sell the timber and provide proper documentation that benefits, other than immediate monetary return from the timber, are of importance. 	<p>This has been done and it is documented in the economic specialist report for the Tenmile - South Helena project. All alternatives appear to be financially feasible.</p>
Firewood	
<p>1. The Helena Forest will generally charge a fee for personal use firewood. The Regional Office will annually determine the fee. Designated free firewood areas will continue only as long as demand is less than supply.</p>	<p>Not applicable to the project because the project area does not have any free firewood areas.</p>
<p>2. Logging areas will be open to public firewood gathering after the sale is closed and prior to burning logging debris and closing roads, if wood is available and other resource values, such as wildlife snags, downed logs, and soils, can be protected.</p>	<p>This standard applies and is met. See chapter two of the DEIS, Design Elements Common to Action Alternatives 2 and 3</p>
<p>3. Promote a green firewood program where desirable for resource management for both commercial and private firewood gatherers.</p>	<p>Not applicable to the Tenmile South Helena Project because green firewood permits are not proposed.</p>
<p>4. The public will be informed of firewood gathering opportunities through the local media. Maps and directions to firewood gathering areas will be available at FS offices.</p>	<p>Map and directions to treatment units with firewood opportunities would be made available at Forest Service offices.</p>
<p>5. Permits will be required whenever tractors, rubber-tired skidders, jammers, or other yarding equipment normally used by the logging industry are used for yarding firewood.</p>	<p>This standard is met. Equipment would not be allowed to remove firewood from units thus permits would not be required. The exception to this would be in private land buffer units where fuel (in the form of firewood) could be removed by the public through various methods including equipment. In the event this occurs, required permits would be issued if appropriate and would be consistent with the analysis of this DEIS.</p>
<p>6. Providing firewood will be emphasized as a slash treatment method.</p>	<p>This standard applies and is met. Firewood gathering opportunities may be utilized as a slash disposal method in treatment units where post-treatment debris exceeds soil coarse woody debris retention guidelines. Refer to the Forested Vegetation and Soils Specialist Reports.</p>
Water, Soil, and Air - Municipal Watershed Guidance	
<p>1. Municipal watersheds will be managed under multiple-use concepts and direction. Management area guidelines will identify permissible land uses, restrictions on land uses, and special measures required to ensure a high quality and quantity municipal water supply. Presently, there are two municipal watersheds on the Forest, Tenmile and McClellan.</p>	<p>This standard applies and is met. This project is consistent with management area standards and guidelines.</p>

Standard	If Standard applies, how is standard being met
2. Design and implementation of projects within the watershed will be guided by FSM 2542.12, as well as specific management area standards and guidelines.	This standard applies and is met. Pertinent soil and water best management practices (BMPs) or resource protection measures listed in the Forest Service National Core BMP Technical Guide (USDA FS, 2012)) will be implemented.
3. An environmental analysis will be prepared in coordination with the concerned municipality and the State Water Quality Bureau for each new project proposed within the municipal watershed which could potentially result in degradation of water quality.	This standard applies and is met. The project was developed in coordination with the City of Helena and Montana DEQ.
4. Each project implemented in the municipal watersheds will have a designated Forest Service representative responsible for maintenance of water quality within appropriate state standards. Each contractor will designate a representative, who will normally be at the project site, with the authority to take whatever action necessary to remedy any situation which might result in violation of state water quality standards.	<p>This standard applies and is met. The project has a “designated FS representative responsible for maintenance of water quality within appropriate state standards,” and “each contractor will designate a representative with the authority to take whatever action necessary to remedy any situation which might result in violation of state water quality standards”.</p> <p>Project implementation and post-implementation effects will be monitored to ensure that resource protection measures are implemented properly and are effective.</p>
5. Plans and specifications for projects proposed for municipal watersheds will be coordinated with the municipality involved and submitted to the Montana State Department of Health and Environmental Sciences for review and approval as required by Montana Laws regarding public water supply as amended by Chapter No. 556, 1979, 75-6-112.	This standard applies and is met. Montana Code Annotated Title 75, Chapter 6, Section 112 prohibits alteration of a system of water supply without Department of Environmental Quality (DEQ) review and approval. The design of the Project was coordinated with the City of Helena Staff and the State of Montana DEQ Staff. Additionally, comments received by the DEQ will be incorporated into the final design of the Project.
General Watershed Guidance	
1. Coordination with the State of Montana, as required by the Clean Water Act (33 CFR §208), concerning stream channels and water quality protection.	This standard applies and is met. The project was developed in coordination with the City of Helena and Montana DEQ.
2. Watershed improvement projects will be identified, prioritized, and developed on a watershed basis (see Appendix T).	This standard applies and is met. Several watershed improvement projects are key components of this project, and are outlined in the Hydrology Report.
3. A project which causes excessive water pollution, undesirable water yield, soil erosion, or site deterioration will be corrected where feasible, or the project will be re-evaluated or terminated.	This standard applies and is met. Net project effects were predicted to be positive for water quality and watershed conditions (see Hydrology Report). However, in the event that issues as outlined in this standard were to arise during project implementation, the project would be corrected as dictated in the Project Criteria section of the EIS, Hydrology Report, and ROD.
4. Projects involving significant vegetation removal will, prior to including them on implementation schedules, require a watershed cumulative effects feasibility analysis to ensure that water yield or sediment will not increase beyond acceptable limits. The analysis will also identify opportunities, if any exist, for mitigating adverse effects on water-related beneficial uses.	This standard applies and is met. The potential effects discussed in this standard were evaluated and described in the Hydrology Report.

Standard	If Standard applies, how is standard being met
5. Practices in the Soil and Water Conservation Practices Handbook (FSH 2509.22) developed cooperatively by the State Water Quality Agency and the Forest Service will be incorporated, where appropriate, into all land use and project plans as a principal mechanism for controlling non-point pollution sources and meeting soil, State water quality standards and other resource goals.	This standard applies and is met. Pertinent soil and water best management practices (BMPs) or resource protection measures listed in the Forest Service National Core BMP Technical Guide (USDA FS, 2012) will be implemented.
6. Water rights for non-consumptive water uses (instream flows) necessary to maintain fisheries habitat, recreational uses, or other beneficial water uses will be claimed for appropriate waterbodies and streams.	This standard does not apply to the Tenmile – South Helena project.
7. An environmental analysis, following the process in FSMs 2526 and 2527, will be made for all management actions planned for flood plains, wetlands, riparian areas, or bodies of water prior to implementation. This analysis will determine the short- and long-term adverse impacts and mitigating measures associated with the planned management actions.	This standard applies and is met. The potential effects discussed in this standard were evaluated and described in the Hydrology Report.
8. Water transmission lines, dams, and hydro-meteorological data sites will be maintained by the permittee in a safe and serviceable condition. Unsafe or unserviceable facilities will be repaired to approved engineering standards or removed from service.	This standard applies and is met. This project has been designed in coordination with the City of Helena and NRCS snow survey.
9. Activities that might affect the validity of data collected at hydro-meteorological data sites will be coordinated with the permittee or cooperating agency before implementation of the project.	This standard applies and is met. This project has been designed in coordination with the City of Helena and NRCS snow survey.
10. Applications for hydropower, water diversion, water storage, or other water-related facilities will be evaluated on a case-by-case basis. The applicant may be required to use private consultants or other personnel to make environmental studies needed by the Forest Service and/or state agencies for evaluation of the proposal. Close coordination and cooperation with other agencies where appropriate will be sought.	This standard does not apply to the Tenmile – South Helena project.
11. Instream flows adequate to protect the aquatic environment will be maintained during any project which removes water from any stream.	This standard applies and is met. Instream flows would be maintained at streams where culverts are replaced as part of this project (see Hydrology Report).
Airshed Guidance	
1. Management activities that affect air quality will comply with Federal and state standards and the Montana Cooperative Smoke Management Plan. (The Plan is part of Fire Planning Records.)	Implementation of the action alternatives would be compliant with the Forest Plan because all prescribed fire operations must comply with Federal and State standards and the Montana Cooperative Smoke Management Plan.
2. Protect air quality by cooperating with Montana Air Quality Bureau in the Prevention of Significant Deterioration (PSD) program and State Implementation Plan (SIP).	Regardless of no action, any Forest Service treatments either ongoing or planned will be required to adhere to air quality standards and direction as outlined in the Forest Plan.
Soil Guidance	

Standard	If Standard applies, how is standard being met
1. In accordance with NFMA, RPA, and Multiple Use-Sustained Yield Act, all management activities will be planned to sustain site productivity. During project analysis, ground disturbing activities will be reviewed and needed mitigating actions prescribed.	The Tenmile - South Helena Project complies with FP soil guidance because effects from soil disturbance would not be an irreversible commitment of resources (refer to Soils Specialist Report), and thus would not cause permanent impairment of the productivity of the land in accordance with MUSY, RPA and NFMA. In addition, proposed ground disturbing activities have been reviewed for the Tenmile – South Helena Project and necessary mitigation has been prescribed including erosion control measures for all areas of soil disturbance. Refer to the Soils Specialist Report.
2. Areas of decomposed granite soils will be identified and erosion control measures planned prior to any ground disturbing activities.	Areas of granitic soils have been identified and mitigation measures identified. See Soils Specialist Report.
3. To reduce sedimentation associated with management activities, the highly sensitive granitic soils, which cover about 20 percent of the Forest, will have first priority for soil erosion control.	Areas of granitic soils have been identified and mitigation measures identified. See Soils Specialist Report.
Minerals General	
1. The 1964 Wilderness Act stipulates that effective December 31, 1983, no further mineral entry would be permitted in existing wilderness areas. This includes leasing for oil and gas, applying for patent on existing claims, and staking new claims. However, citizens' rights to enter public land for prospecting or working valid existing claims is unchanged.	This standard does not apply. The project area does not include wilderness.
2. Areas withdrawn from mineral entry should be reevaluated every five years in accordance with Federal Land Policy and Management Act (FLPMA) to determine if the withdrawal is still necessary. (See Appendix Q.)	This standard is met because no areas are being withdrawn from mineral entry.
3. Access for development of locatable and leasable minerals will be allowed on a case-by-case basis. Access should be directed toward minimizing resource impacts and be coordinated with other land uses.	This standard is met because access is not being precluded in relation to this project.
Locatable Minerals	
1. Consistent with the Mining and Mineral Policy Act of 1970, continue to encourage the responsible development of mineral resources on National Forest lands. Concurrently, require mitigation measures to protect surface resources.	This standard is being met because development of mineral is not being precluded in relation to this project.
2. Provide guidance to miners and prospectors for planning reclamation and to minimize environmental damage.	This standard does not apply because the project is not related to giving guidance to miners.
3. Increase I&I efforts through publicizing the appropriate laws, regulations, and policies, to reduce cases of non-compliance from lack of knowledge of mining rules.	This standard does not apply because the project is not related to giving guidance to miners.
4. Increase compliance inspections commensurate with mineral activities.	This standard does not apply because the project is not related to giving guidance to miners.

Standard	If Standard applies, how is standard being met
5. When every reasonable attempt has failed to correct mining operations that are unnecessarily or unreasonably causing or threatening to cause irreparable injury, loss, or damage to surface resources, the Forest Service will seek judicial relief.	This standard does not apply because the project would not interfere with regulations of mining operators.
6. Maintain a liaison with local mining industry and mining associations. Cooperate with Federal and State agencies which administer mineral laws.	This standard does not apply because the project would not interfere with regulations of mining operators.
7. Following mineral development the Forest Service will require reclamation of surface disturbance to prevent or control on- and off-site damage. Reclamation includes, but is not limited to: a. Control of erosion and landslides. b. Control of water runoff. c. Isolation, removal, or control of toxic materials. d. Reshaping and revegetation of disturbed areas. e. Rehabilitation of fisheries and wildlife habitat.	This standard does not apply because the project would not interfere with regulations of mining operators.
Saleable Minerals	
1. Common variety mineral permits will be considered on a case-by-case basis and will be issued only if consistent with the management area goals.	This standard does not apply because the project would not interfere with regulations of mining operators.
Leasable Minerals	
See ROD for Helena National Forest and Elkhorn Mountains Portion of the Deerlodge National Forest Oil and Gas Leasing EIS.	This standard does not apply because the project would not interfere with regulation of mining operators.
Seismic Exploration	

Standard	If Standard applies, how is standard being met
<p>1. An environmental analysis will be completed for each application. A prospecting permit will be issued on a case by case basis and will contain stipulations designed to coordinate surface resource values. The following apply where appropriate:</p> <ul style="list-style-type: none"> a. Water quality and quantity: Stipulations may be issued to limit activities within 100 feet of all streams, lakes, springs, and ponds. b. Threatened and endangered species habitat: Stipulations will be issued to protect threatened and endangered species by limiting activities during critical periods, and protecting important habitat elements. c. Nongame habitat: Stipulations may be used to limit surface use as a coordination and/or mitigation measure for species listed in State of Montana, Species of Special Interest and Concern. (The State species list is part of the Wildlife Planning Records.) d. Big game habitat: To protect key areas for big game (i.e., winter range, summer concentration habitats, calving areas, lambing areas, big game travel routes, etc.), stipulations may be used during critical periods. e. Archeological and Historic Resources: Proposed seismic survey work which may impact identified cultural and paleontological resources will be required to skip portions of the work or to relocate survey lines around known resource areas. Other resource threatening work will be required to fully comply with the Antiquities Act of 1906 and other related Acts pertaining to cultural resources. f. Special Uses, Leases, and Permits: To protect authorized special uses, leases, and permits, include stipulations to restrict occupancy by timing and location on a case-by-case basis. g. Fire: Seismic work during periods of high fire danger may not be allowed. To prevent wildfire, stipulations may be included to restrict timing and location of seismic operations. Stipulations may also be used to specify procedures and fire fighting equipment required by seismic crews. h. Land Stability and Erosion: Surface occupancy stipulations may be used to prohibit occupancy on lands subject to mass wasting and on slopes 60 percent and greater. i. Recreation: To accommodate concentrated recreational areas (i.e., picnic grounds and campgrounds), stipulations may be used to restrict seismic activities by location and timing. 	<p>This standard does not apply because the project would not interfere with regulations of seismic exploration operations.</p>
Land Uses	
<p>1. Approve special use permits only when they comply with the goals of the management area affected. Appendix O provides guidelines for special uses and subdivisions.</p>	<p>This standard does not apply because the project does not include the approval of special use permits.</p>
<p>2. Enhance resource management by working with other agencies and landowners to develop and achieve common resource objectives.</p>	<p>This standard is met as this project has utilized a public scoping process to inform and enhance project planning a design.</p>
<p>3. The Forest will encourage governing entities to proceed with land use planning and zoning prior to subdivision development on lands adjacent to or within the Forest boundary.</p>	<p>This standard does not apply because the project does not include planning and zoning decisions.</p>

Standard	If Standard applies, how is standard being met
4. Developers should provide for all necessary services within the limits of the subdivision without infringing on adjacent National Forest lands. But National Forest lands adjacent to subdivisions can be used for services associated with primary access and/or primary utility corridors if these services cannot reasonably be incorporated within the subdivision, or on other adjacent or nearby properties not administered by the Forest Service.	This standard does not apply because the project does not involve any subdivisions.
5. The Forest Service will attempt to inform non-Federal landowners and land developers adjacent to the Forest of the management direction on the Forest land.	This standard applies and is met because the project has utilized numerous public outreaches and participation opportunities such as open house, scoping, and public comment periods.
6. Adjacent private lands will not preclude multiple use management of lands administered by the Forest Service. But management of Forest Service land will be modified where appropriate and necessary to complement land uses on adjacent non-Federal property.	This standard applies and is met. The purpose of Private land buffer units is, in part, to complement fuel reduction activities on adjacent private land. Other treatment types in the project area would serve a similar purpose by reducing the risk of wildfire and providing for firefighter and public safety.
7. When an environmental analysis for a proposed Forest project indicates that activities on adjacent land will require Forest Service management activities to be restricted to protect soil, water, and wildlife resources, the necessary restrictions will be determined. If no activity on Forest land is possible, the desired management will be scheduled for later decades when sufficient recovery has occurred on adjacent lands to permit the proposed activities on Forest Service land to continue. Exceptions to this policy will be considered on a case-by-case basis, when deferring management would result in adverse impacts to other Forest resources.	This standard is met through project design criteria and BMP implementation.
Landownership Adjustment	
1. A landownership adjustment schedule for the Helena Forest will be developed using the following criteria: a. The priority for acquisition will be for lands with assessed high wildlife, recreation, and watershed values. Acquisition may entail purchase or donation of fee simple or partial interests, such as conservation and scenic easements, or exchange procedures. b. Emphasize acquisition of land and interests in land to allow access to all Helena National Forest lands. c. Emphasize acquisition of trailhead facilities and trail rights-of-ways, especially to wilderness and dispersed recreation areas. d. Consider disposal of tracts where past patenting has resulted in isolated, intermingled National Forest ownerships, such as at York, Rimini, and Unionville.	This standard does not apply because the project does not include acquisition or disposal of land.
Administration Facilities	
1. Provide a cost effective program of maintenance to necessary administrative facilities. This will protect the investment, provide for public and employee's health and safety in accordance with current building codes and standards, and present a neat, well kept appearance in harmony with its surroundings.	The standard does not apply to the Tenmile – South Helena project because no administrative facilities are in the area, or impacted by any alternative.

Standard	If Standard applies, how is standard being met
2. Construct new administrative facilities to replace existing structures that are no longer cost effective to maintain or expand or are inadequate to serve the needs of resource management.	This standard does not apply the Forest Service would not construct new facilities to replace existing structures as part of this project.
Roads	
1. Road construction and reconstruction will be the minimum density, cost, and standard necessary for the intended need, user safety, and resource protection.	The minimum road work is proposed to provide for safe access and fuel removal from the proposed units in the action alternatives. Where short segments of road are identified, they would be designed to current standards as set forth in Forest Service handbook and manual direction FSM 7700, FSH 7709.55 and FSH 7709.56 and would be in compliance with BMP standards.
2. Forest development roads will not be constructed without an approved Area Transportation Analysis. Other road construction will be evaluated on a case-by-case basis.	No new construction of National Forest System roads are proposed under the action alternatives. Construction of temporary roads is evaluated on a case-by-case basis as part of this project.
3. Forest Specialists representing soils, watershed, and fisheries shall identify potential soil erosion, water quality and fisheries problems and provide input to the development of road design standards. Mitigating measures which will be considered in developing these standards include but not limited to: a. Reestablishing vegetation on exposed soils. b. Protecting the road surface through surface stabilization techniques such as dust oil or gravel, especially on decomposed granitic soils. c. Preventing downslope movement of sediment with the use of slash windrows below the fill slopes near stream crossings, baled straw in ditches and catch basins at culvert inlets. d. Reducing soil disturbance in or near streams by diverting clear water around culvert installation sites, especially in important fisheries streams. e. Controlling the concentration of water flow by insloping, outsloping and using minimum grades at stream crossings.	Proposed road work included in the action alternatives including maintenance, reconstruction, temporary roads, and stream crossing improvements, will be conducted in compliance with Montana and FS Region 1 BMPs. These BMPs provide for many mitigation measures associated with roads, including those mentioned in the Forest Plan. The no-action alternative would have no improvement involving the identified measures.
4. Short term local roads will be used for one time road access needs.	Temporary roads used for the project action alternatives will meet this standard for short term local roads.
5. Coordinate transportation planning and road management with State and local agencies and owners of intermingled land.	There are several county and private roads identified as necessary for haul in the action alternatives. Coordination with these agencies and individuals is needed prior to use and haul in accordance with the Forest Plan.
Road Management	
1. The Helena National Forest will generally be open to vehicles except for roads, trails, or areas which may be restricted. (See Forest Visitor Map for specific information.) The Forest Road Management Program will be used to review, evaluate, and implement the goals and standards of the management areas in the Forest Plan with regard to road, trail, and area wide motorized vehicle use.	This standard is met because no changes in existing travel management direction are proposed under the alternatives with respect to allowed uses and roads available for public use.

Standard	If Standard applies, how is standard being met
<p>2. Road management decisions will be based on user needs, public safety, resource protection, and economics. Most existing roads will be left open. But most new roads will be closed, at least during critical periods for big game.</p> <p>The criteria to be used for road, trail, or area restrictions are as follows:</p> <ul style="list-style-type: none"> a. Safety - Restrictions may be necessary to provide for safety of Forest users. b. Resource Protection - Unacceptable damage to soils, watershed, fish, wildlife, or historical/archaeological sites will be mitigated by road restrictions or other road management actions as necessary. Restrictions for wildlife reasons will be coordinated with the MDFWP. c. Economics - Restrictions will be considered if maintenance costs exceed benefits. d. Conflicting Use - Conflicts between user groups (especially motorized vs. non-motorized) may require restrictions. e. Facility Protection - Restrictions may be necessary to prevent damage to administrative sites, special use facilities, or other improvements. f. Public Support - Public concern may necessitate restricting or opening some roads, trails, or areas. g. Management Objectives - Road management will be used to achieve land management objectives. 	<p>This standard is met because no changes in existing travel management direction are proposed under the alternatives with respect to allowed uses and roads available for public use.</p>
<p>3. The travel restrictions will be reviewed annually and revised as necessary to meet the goals and objectives of the Forest Plan.</p>	<p>This standard is met because no changes in travel management direction are proposed under the project's alternatives with respect to allowed uses and roads available for public use, as the scope of the project is associated with implementing proposed vegetation treatments.</p>
<p>4. Enforcement of the Road Management Program will be a high priority. Weekend patrolling, signing, gating, obliterating unnecessary roads, and public education will be used to improve enforcement. Enforcement will be coordinated with the MDFWP and other State and local agencies.</p>	<p>This standard is met because no changes in travel management direction are proposed under the project's alternatives with respect to allowed uses and roads available for public use. Short-term delays and closures may be planned in order to provide for public safety during implementation of the vegetation treatments and fuel removal haul associated with the action alternatives.</p>
Road Maintenance	
<p>1. Roads will be maintained in accordance with direction provided in FSH 7709.15 (Transportation System Maintenance Handbook) and will be at a level commensurate with the need for the following operational objectives: resource protection, road investment protection, user safety, user comfort, and travel efficiency.</p>	<p>This standard is met because road maintenance and reconstruction in the action alternatives will be performed in accordance with the Forest Plan and the Montana and Region 1 BMPs.</p>
<p>2. Assigned maintenance levels will be reviewed annually and revised if management objectives change.</p>	<p>This standard is met because no changes in assigned maintenance levels are proposed in the alternatives.</p>

Standard	If Standard applies, how is standard being met
3. A Forest Road Maintenance Schedule will be prepared annually and be responsive to the long term needs of the Forest Transportation System.	Not applicable to this project, though, there are several roads proposed in the action alternatives for maintenance and reconstruction to accommodate safe product haul while providing for minimal negative resource impacts.
4. Forest specialists representing soils and watershed shall provide input to the road maintenance planning process to verify maintenance standards, identify rehabilitation needs, and designate roads which should be permanently closed for resource protection. Specialists will annually submit capital investment project proposals for major road reconstruction needs.	Fisheries and watershed specialists worked with the IDT Team and transportation specialist to develop site-specific improvements for inclusion in each action alternative. Once a decision is made, these sites may qualify for a number of supplemental funding opportunities as they may not be required for haul. No improvements would occur under the no-action alternative.
Trails	
1. Trail management, such as trail standards, maintenance schedules, funding, trail use, construction, and reconstruction, will follow the guidance in Trails Management Handbook, FSH 2309.18.	This standard does not apply because the project does not propose any trail management activities. However, some trails in the project area may be utilized to access units. Furthermore, standing dead trees adjacent to some trails would be removed. Design criteria are in place to restore any damages to trail back to their pre-implementation condition and would be consistent with the Trails Management Handbook, FSH 2309.18.
2. Generally, trail maintenance work priorities will be established as follows: a. Priority 1. Activities to correct unsafe conditions relative to management objectives. b. Priority 2. Activities to minimize unacceptable resource and trail damage. c. Priority 3. Activities that restore the trail to planned design standards.	This standard does not apply to the Tenmile – South Helena project trail maintenance work is not proposed as part of this project.
3. Trail construction/reconstruction will be designed and accomplished to be compatible with the recreation settings and management area goals.	This standard does not apply to the Tenmile – South Helena project because the project does not propose any trail construction or reconstruction.
4. Trails may be abandoned or rerouted when a road changes the character of the trail or when the maintenance cost exceeds the benefit.	This standard does not apply to the Tenmile – South Helena project because no existing trails are proposed to be abandoned or rerouted.
Protection - Insect and Disease	
1. Silvicultural systems will be the primary tool for preventative pest management. Use silvicultural systems to: (1) improve species diversity, growth, and vigor for stands and (2) increase the size diversity and class diversity between stands.	This standard applies and is met with the Action Alternatives through the application of silvicultural tools that promote growth and vigor. Refer to the Forested Vegetation specialist report and silvicultural diagnoses (project file). Alternative 1 does not utilize silvicultural systems.

Standard	If Standard applies, how is standard being met
2. During ongoing infestations, control insects and disease through silvicultural and biological practices. Chemical controls will be limited to high value areas or used on a broader scale only when all other measures have failed and other resource values can be protected. Emphasize cooperative control measures between Federal, State, and private landowners.	This standard applies and is met. Proposed silvicultural treatments with the Action Alternatives address the mountain pine beetle infestation by attempting to limit future susceptibility to a variety of insects on a mosaic of treated stands as described in the Forested Vegetation Specialist Report. The HNF has also done extensive outreach and coordination efforts with other landowners concerning the mountain pine outbreak. No silvicultural or biological practices would occur with Alternative 1.
3. Biological practices will be considered in controlling insect and disease infestations.	The standard does not apply. There are no feasible biological practices developed for the control of the insects or diseases currently active in the project area.
4. If possible, harvest stands which are a high risk for mountain pine beetle attack before harvesting moderate or low risk stands.	This standard does not currently apply since lodgepole pine stands have already lost most of the susceptible trees.
Protection - Wildfire	
1. The appropriate suppression response(s) is discussed by management area. See Table I in Appendix R, Fire Management, for suppression summaries.	Fire suppression strategies and tactics for all fire starts (appropriate management response) are based on firefighter and public safety, fire location, access, barriers to fire spread, threatened infrastructure, current and forecasted weather, available resources, vegetation conditions, and management area direction. This area is currently listed as a Fire Management Unit (FMU) 1 and 2 within the Helena National Forest Fire Management Plan. For the majority of fires in FMU1, suppress those fires that have the potential to damage timber and/or property under current or predicted fire behavior and intensities. For the majority of fires in FMU2, routinely consider managing unplanned ignitions to meet resource and human value protection objectives. In all cases, provide for firefighter and public safety at all times. Where FMU2 overlaps with Wildland Urban Interface (WUI) consider control and contain strategies to minimize risk to life and property. (Helena National Forest Fire Management Plan 2013 - 3.2.2B FMU2 Guidance) However, due to this including the upper Tenmile watershed and current fuel conditions in the project area, expected suppression method call for rapid response and aggressive suppression strategies. The suppression methods and management of this area will not change with either alternative.

Standard	If Standard applies, how is standard being met
2. Locate timber sales, or cutting units within a sale, to break-up contiguous natural fuel.	The proposed treatments would reduce existing surface fuel loading levels and break up contiguous vegetation to create landscape patterns that alter fire spread. Treated areas, in general, would provide places where firefighters can more safely and effectively perform suppression actions thereby limiting the potential for high-intensity fire to spread within and towards the WUI or within the Tenmile watershed
Protection - Law Enforcement	
1. Law enforcement agreements will be maintained with cooperating counties.	This standard is not applicable to the Tenmile – South Helena project because standard is outside the scope of activities being proposed.
2. Each Ranger District should maintain at least one employee qualified in advanced law enforcement (Level III).	This standard is not applicable to the Tenmile – South Helena project because standard is outside the scope of activities being proposed.
3. Across the Forest, two full-range law enforcement positions (Level IV) should be maintained.	This standard is not applicable to the Tenmile – South Helena project because standard is outside the scope of activities being proposed.
Prescribed Fire – General	
1. A burning schedule and specific objectives should be completed for each project.	A detailed silvicultural prescription will be completed for each treatment unit prior to implementation which will be carried through into the prescribed fire burn plan and prescribed fire parameters.
2. The burning prescription should be plant specific (i.e., burning may set back such species as bitterbrush and Idaho or rough fescue, if done with insufficient soil moisture or when "greening up").	A detailed silvicultural prescription will be completed for each treatment unit prior to implementation which will be carried through into the prescribed fire burn plan and prescribed fire parameters.
3. Prescribed burning should not exceed the natural fire frequency of the Fire Group.	Current proposed treatments involving prescribed burning would not exceed the natural fire frequency
4. Use prescribed fire only during periods of adequate smoke dispersal and in areas where water quality can be adequately maintained.	Approval for implementation of the prescribed fire burn plan will be obtained through Montana/Idaho Airshed Management System, as well as having State and County permits in place prior to ignition.
5. The Helena National Forest Soil Survey will be used to assist with individual site selection, to avoid potential soil and/or watershed degradation.	For all planned broadcast burn units, field evaluations will be completed to determine DSD from harvest activities. This site visit will determine the burn prescription specific to burn severity to soil. All prescriptions will be design to minimize DSD and meet Regional Standards.
6. Smoke sensitive areas will be identified and burning prescriptions developed accordingly.	All Class I Airsheds and sensitive receptors have been identified within 60 kilometer radius around the project area and will be carried forward into the prescribed fire burn plans. Prior to ignition County Health Services for both Lewis & Clark and Powell Counties will be notified of predicted impact areas so they can notify sensitive receptors within the area.

Standard	If Standard applies, how is standard being met
7. The MDFWP should be invited to participate in selecting treatment sites, executing burning plans, and monitoring and evaluating the overall program.	MDFWP will be on the burn plan contact list.
Prescribed Fire - Timber	
1. Where timber production is a primary land use, prescribed burning will only be applied where timber production can be maintained or enhanced by burning.	No burning is proposed with No Action, but the standard applies to the Action Alternatives and is met. Burning would primarily occur after harvest, in part to promote desirable regeneration. This burning would be designed to not preclude natural regeneration and future timber production. See Forested Vegetation Specialist Report.
2. Prescribed fire, when used as a fuels management or site preparation technique after harvest, should be coordinated with the timber stand's silvicultural prescription.	Standard does not apply to No Action, but does apply to the Action Alternatives and is met. Burning would be incorporated into silvicultural prescriptions. Refer to Forested Vegetation Specialist Report.
Prescribed Fire - Range and Wildlife	
1. Areas that have a demonstrated need to maintain or increase forage because of conifer encroachment, shrub invasion, and imbalance in forb/grass ratios, and/or where grass and shrubs are deteriorating should be recommended for prescribed burning.	A rangeland management specialist was part of the planning team for this project. The needs for the range resource were brought forward in the range report.
2. Where livestock and wildlife share sagebrush areas, prescribed fire will be designed to produce a mosaic of burned and unburned islands.	Prescribed fire is primarily focused in timber stands. The prescription for any sagebrush stands with the RX units will have a low severity prescription designed to create a mosaic burn pattern.
3. Just prior to and following a prescribed burn on grassland, livestock use should be withheld to ensure that adequate fine fuels are available for burning and to prevent overuse of new growth.	Fuels and range will work together during the planning process of the prescribed fire to plan management in pre and post fire.
Riparian	
1. Riparian areas will be delineated prior to implementing any management activities. Riparian areas include: <ul style="list-style-type: none"> a. Aquatic ecosystems (water, streambed, banks) b. Floodplains c. Riparian ecosystems (area dominated by riparian vegetation) d. One hundred feet from edges of all perennial streams, lakes, and other water bodies, including a, b, and c above. 	Standard is met. Riparian areas will be delineated and avoided prior to project implementation. A summary of relevant design criteria and mitigation measures are included in Chapter 2 of the EIS as well as in the Fisheries and Hydrology reports.
2. Discourage concentrated use, such as campsites and roads, in riparian areas. Close wet meadows and wet areas to nonsnow ORVs.	This standard would be met because the Tenmile – South Helena Project does not propose concentrated use or further development of campsites or permanent roads in riparian areas. Furthermore, the project would decommission several segments of roads that are currently within riparian areas or wetlands.

Standard	If Standard applies, how is standard being met
3. Identify, prioritize, and develop riparian area rehabilitation projects by watershed.	This standard applies and is met. The project would decommission several segments of roads that are currently within riparian areas or wetlands, and restore a partially drained wetland—see hydrology report for details.
4. Roads should not be constructed in the riparian area except to cross them. Use the appropriate soil and water conservation practices to minimize sedimentation during instream construction activities and include them in road construction contracts.	Standard would be met. Proposed temporary roads are generally in upland locations that would likely not pose a risk of sediment delivery to streams. Some road/stream crossings associated with temporary roads are proposed in each action alternative. Mitigation measures would be implemented to minimize impacts to riparian areas. A summary of design criteria and mitigation measures is included in the Fisheries, Hydrology, and Roads reports.
5. Assure that road construction in riparian areas is substantially completed or winterized during winter shut down to minimize peak flow sediment yield during spring thaw.	This standard is met. Design criteria would minimize impacts from roads to riparian areas during winter—see design criteria in Chapter 2 and in the hydrology report for details.
6. Generally, avoid lateral fills within normal high water marks.	This standard is met. Design criteria would minimize impacts from roads to riparian areas during winter—see design criteria in Chapter 2 and in the hydrology report for details.
7. Generally, avoid stream course encroachment and channelization.	This standard is met. Stream course encroachment and channelization are not expected as a result of the Tenmile – South Helena project.
8. Use of chemicals within the riparian area will be minimized to the extent feasible, will be coordinated with wildlife, watershed, and fisheries personnel and a certified pesticide applicator.	This standard is met. Use of chemicals near riparian areas and water bodies would be limited—see Noxious Weeds report.
9. Riparian areas will be managed to be compatible with dependent wildlife species.	This standard is met. Under the action alternatives, the structure and functioning of local wetlands and riparian zones would differ little from what would occur under natural conditions. Dead and live trees within viable wet sites and around their margins would be left intact. Primary departure from natural conditions would be in the surrounding upland areas from which most snags and woody debris would be removed. Wildlife species approaching the wetlands and riparian zones would thus be moving across open grass/forb/shrub habitat rather than through a maze of woody debris. In either case, the overhead cover would be gone. Differences generated by the action alternatives would not be noteworthy. Treatments that mimic disturbance processes (as is the case here) in wetlands and riparian zones are important in maintaining species richness and diversity, both plant and animal.
10. The timing and type of machinery used in riparian areas should be planned to minimize site damage.	This standard is met. Activities and equipment would be restricted in riparian areas as outlined in the design criteria listed in chapter 2, as well as in the hydrology, soils, and fisheries reports.

Standard	If Standard applies, how is standard being met
11. Provide vegetative cover adjacent to streams to serve as a filter strip for sediment and maintain optimum water temperatures, as well as provide large debris for long-term instream fish cover and pooling. Where vegetative manipulation is possible, the activities will strive to achieve a balance of age classes and desired species composition.	This standard is met. Vegetation removal from riparian areas would be limited, as outlined in the design criteria listed in chapter 2, as well as in the hydrology, soils, and fisheries reports.
12. Provide for stream crossing structure design that allows free water flow and fish passage.	Standard is met. The project would upgrade several undersized culverts in the project area. Replacement culverts will be designed in accordance with forest-wide standards, including aquatic organism passage where appropriate.
13. Emphasize off-stream watering in range allotments to prevent damage to the riparian area.	Not applicable to the Tenmile – South Helena project because the project does not propose any changes to livestock watering methods.

Standard					If Standard applies, how is standard being met
14. Livestock grazing in riparian areas will be controlled at the following levels of utilization:					Not applicable to the Tenmile – South Helena project because project proposals do not affect the levels at which livestock graze in riparian areas.
Vegetative Type	Grazing Systems	Vegetative Condition Class	Forage Utilization by Weight	Browse Utilization by % of Leader Use	
Grasslands/ Grass-like/Forb	Continuous	Good	5%	N.A.	
		Fair	5%	N.A.	
		Poor	20%	N.A.	
	Rest-Rotation	Heavy Use	60%	N.A.	
		Pasture 1/ Light Use Pasture	5%	N.A.	
	Defer-Rotation	Heavy Use	50%	N.A.	
Pasture Light Use Pasture		40%	N.A.		
Willow/ Grass/ Grasslike and Willow/ Forest	Continuous	Good	55%	50%	
		Fair	5%	50%	
		Poor	5%	50%	
	Rest-Rotation	Heavy Use	70%	50%	
		Pasture 2/ Light Use Pasture	50%	50%	
	Defer-Rotation	Heavy Use	60%	50%	
Pasture Light Use Pasture		5	50%		
¹ Trampled areas and streambank damage caused during heavy use year should be healed or stabilized with the following year. ² Disturbance on heavy use pasture should be stabilized or healed prior to use the following year.					

Table B-2b. Management Area Direction and Acres

Table 254. Management area direction and acres.

Management Standards	If Standard applies, how is standard being met
<p>• Management Area H1 (14,292 acres)</p> <p>Management Goals - Provide a quantity and quality of water which will, with adequate treatment, result in a satisfactory and safe domestic water supply for the City of Helena. Provide cover and forage for big game animals and necessary habitat components for nongame animals. Provide for dispersed recreation opportunities.</p> <p>Description - This management area consists of about 75% of the National Forest Land in the Tenmile municipal watershed which lies about 10 air miles southwest of Helena. The entire watershed currently supplies about one half of Helena's domestic water. About 25 percent of this watershed management area is in private ownership, consisting mostly of patented mining claims. Some of these mines are currently active. The town of Rimini also lies within this management area. Vegetative cover varies from dense lodgepole and brush on north and east slopes to open scattered Douglas-fir and ponderosa pine on south and west slopes. This area provides a variety of recreational opportunities as well as habitat for wildlife. This management area contains trail segments that will likely be proposed as part of the Continental Divide National Scenic Trail System.</p>	
Recreation – Non-motorized dispersed recreation will continue within the drainage; however no additional facilities will be constructed to support the use. Developed recreation facilities will not be constructed.	Not applicable to the Tenmile - South Helena Project because there are no proposals that change the current travel management status, constructs, or maintains trails. This standard is met.
Visual – Management practices will generally follow guidelines for the modification VQO. The portions of this area (if any) that are within the sensitive viewing areas of the roads, trails, and areas listed in Appendix B will be managed to meet the VQOs noted in the appendix. [See Forest Landscape Management Book, vol. 2 (Ag. Hdbk. No. 462) for definitions of VQOs and how they are applied.]	Implementation of both action alternatives would be consistent with the 1986 Helena National Forest Plan. By implementing the design criteria described above, VQOs for modification would be met.
<p>Wildlife and Fisheries – Wildlife habitat improvement practices, including road management, prescribed fire, and other techniques, will be used to maintain and/or enhance the diversity of wildlife habitat.</p> <p>Maintain adequate thermal and hiding cover adjacent to forage areas as determined by a wildlife biologist. Generally this means providing at least 25 percent thermal cover, on identified winter range.</p>	<p>This standard applies. Various watershed improvement activities are proposed as part of both action alternatives. Proposed vegetation and prescribe fire treatments would reduce the probability of high-severity wildfires and their associated detrimental effects to important values including wildlife habitat.</p> <p>Maintain adequate thermal and hiding cover adjacent to forage areas. Generally this means providing at least 25% thermal cover, where available, on winter range. The existing thermal cover condition is 19% percent; Alternatives 2 and 3 would reduce it to 17% and 16% respectively). A site-specific amendment would be needed to implement either action alternative.</p>
Range – The area grazed and the number of AUMs permitted in the watershed will not be increased. However, if livestock grazing decreases the water quality, then the grazing practices will be changed to maintain the water quality.	Not applicable because the Tenmile-South Helena Project does not propose any changes to livestock use within the project area.

Management Standards	If Standard applies, how is standard being met
Timber – Timber harvest should be implemented only if it can be used as a tool to maintain or enhance watershed and wildlife habitat values. Forested land is classified as unsuitable for timber management.	Vegetation treatment, including commercially removing fuel from units, would be used to regenerate stands with heavy mortality, and to maintain healthy stands that provide wildlife habitat and soil stabilization. Reduction of down fuels is intended to reduce fire residence time and resultant soil damage.
Water and Soils – Watershed improvement needs have been inventoried in the Tenmile watershed and priority projects identified. The drainage has the top priority for implementation of watershed improvement projects as funding becomes available. (See Appendix T).	This standard applies and is met. The Tenmile – South Helena project proposes to implement watershed improvement activities.
Minerals – Locatable – To the extent feasible, timing of mineral activities will be coordinated with the needs of wildlife and water quality standards. This generally will require negotiations during development of operating plans for no surface occupancy, from December 1 to May 15 on winter range and during peak runoff. -Leasable - See Forest Plan Amendment #13 for lease standards	This standard does not apply. The Tenmile – South Helena does not propose any mineral activities or changes to existing mineral operations.
Lands – This management area is an avoidance area for utility corridors (see Appendix P).	This standard does not apply to the Tenmile – South Helena Project.
Facilities - Roads will be constructed as needed to meet the management objectives of the area. Minimizing road length, grade and amount of disturbed area will be primary project design criteria. Portions of existing roads that are reconstructed will be maintained at a standard that will prevent unacceptable erosion or will be closed and stabilized. All new roads will be closed and stabilized when projects are terminated.	This standard applies and is met. Temporary Roads would be constructed for the action alternatives to access vegetation treatment units. Design criteria incorporate minimizing road length, grade and amount of disturbed area. Temporary roads would be closed and rehabilitated after use. Existing roads would be maintained or reconstructed in accordance with Montana and R1 BMPs under the action alternatives.
Protection – Evaluate areas periodically for significant insect and disease problems. Endemic levels will be accepted as normal. If epidemic levels develop and control is necessary, the control method should minimize impacts on watershed and wildlife values. Use rapid and aggressive fire control methods in this management area. Prescribed fire may be used as a tool to reduce natural fuels and improve quantity and quality of wildlife forage. Fire suppression methods will be selected to minimize or eliminate soil disturbance of the watershed.	This standard applies and is met through removal of insect-killed trees, establishment of desirable regeneration, and improving forest health to be more resistant to bark beetle activity in the future. Insect-killed trees are proposed for removal in treatment units with all Action Alternatives. Fire suppression strategy will not change with any alternative. Prescribed burning will be used in action alternatives to improve wildlife forage.
Riparian – See Forest-Wide Standards.	
Management Area H2 (4,145 acres)	
Management Goals - Provide a quantity and quality of water which will, with adequate treatment, result in a satisfactory and safe domestic water supply for the City of Helena. Provide cover and forage for big game animals and necessary habitat components for nongame animals. Provide healthy timber stands and optimize growing potential over the planning horizon while protecting the soil and water resources. Provide for dispersed recreation opportunities.	

Management Standards	If Standard applies, how is standard being met
Description - This management area consists of about 25% of the Tenmile Municipal watershed with lies about 10 air miles south west of Helena. The entire watershed supplies about one half of Helena's domestic water. This management area contains parcels of productive timber stands of lodgepole pine and Douglas-fir. These parcels are found in Tenmile, Minnehaha, and Walker Creeks on the west side of the watershed and in Beaver and Banner Creek on the east side. This area provides winter and summer habitat for a variety of wildlife species. This management area contains trail segments that will likely be proposed as part of the Continental Divide National Scenic Trail System.	
Recreation – Non-motorized dispersed recreation will continue within the drainage, however no additional facilities will be constructed to support the use. Developed recreation facilities will not be constructed. Controls on motorized recreation will be implemented where necessary, to protect the vegetation, soil, and water resources and to prevent road damage.	There are no proposals that change the travel management status, constructs, or maintains trails. Control measures on motorized recreation would be implemented as a result of decommissioning of unauthorized roads in the project area. This standard is met.
Visual – Management practices will generally follow guidelines for the modification VQO. The portions of this area (if any) that are within the sensitive viewing areas of the roads, trails, and areas listed in Appendix B will be managed to meet the VQOs noted in the appendix. [See Forest Landscape Management Book, Vol. 2 (Ag. Hdbk. No. 462) for definitions of VQOs and how they are applied.]	Implementation of both action alternatives would be consistent with the 1986 Helena National Forest Plan. By implementing the design criteria described above, VQOs for modification would be met.
Wildlife and Fisheries – Wildlife habitat improvement practices, including road management, prescribed fire, and other techniques, will be used to maintain and/or enhance the diversity of wildlife habitat. Forest-wide Standards and Appendix D contain guidance for T&E species habitat. Maintain adequate thermal and hiding cover adjacent to forage areas as determined by a wildlife biologist. Generally this means providing at least 25 percent thermal cover on identified winter range.	This standard applies. Various watershed improvement activities are proposed as part of both action alternatives. Proposed vegetation and prescribe fire treatments would reduce the probability of high-severity wildfires and their associated detrimental effects to important values including wildlife habitat. Maintain adequate thermal and hiding cover adjacent to forage areas. Generally this means providing at least 25% thermal cover, where available, on winter range. Currently there is only 9% of thermal cover on winter range in MA H-2 which is already below the 25% threshold. Alternatives 2 and 3 would reduce this amount to 7% and 5%, respectively. A site-specific amendment would be needed to implement either action alternative.
Range – See Forest-Wide Standards	Not applicable because the Tenmile-South Helena Project does not propose any changes to livestock use within the project area.

Management Standards	If Standard applies, how is standard being met
<p>Timber - This management area is suitable for timber management activities. Timber harvest practices include clearcutting, group selection, and shelterwood harvest, depending on habitat group, physical site conditions, and silvicultural objectives. Precommercial thinning and intermediate harvest may occur where needed as determined by silvicultural objectives and project planning. (Appendices H and M provide broad guidelines for various habitat groups.) As a minimum, a cutover area will not be considered an opening when: (1) a new forest stand is established and certified as stocked (2) vegetative conditions reach the point where harvest of additional timber can occur and the combined area can still meet watershed management objectives. Prescribed burning or other techniques may be used for slash disposal, site preparation, and silvicultural objectives. In habitat groups where fire is not a useful treatment tool, logging and scattering, yarding unmerchantable material (YUM), or other methods will be used to reduce fuel accumulations and prepare sites for regeneration. Project level planning will provide for stand regeneration within five years of final harvest. Even-aged stands will be scheduled for final regeneration harvest when they generally have reached the culmination of mean annual increment (CMAI) of growth. Exceptions include thinning or other stand improvement measures, salvage or sanitation harvest, management for experimental or research purposes and to meet other resource objectives. CMAI for primary species on the Helena National Forest is shown in Appendix H.</p>	<p>Alternative 1, the No Action Alternative, provides zero acres of future healthy timber stands. Timber management under Alternative 2 provides 6,543 acres of healthy timber stands where regeneration units have reached CMAI. Timber management under Alternative 3 provides 4,277 acres of healthy timber stands with regeneration units reaching CMAI.</p>
<p>Water and Soils – Watershed improvement needs have been inventoried in the Tenmile watershed and priority projects identified. The drainage has the top priority for implementation of watershed improvement projects as funding becomes available (See Appendix T). Timber harvest will not create runoff increases which are likely to result in stream channel degradation. All timber sale proposals will include an analysis of current conditions and potential sediment production. The project proposal will analyze and evaluate the potential water quantity and quality, and soil productivity impacts; mitigation measures will be developed to minimize adverse effects. If a proposal shows the water quality cannot be maintained, within State standards for A-1 watersheds and public water supplies the project will be redesigned to meet the standards or terminated. Water quality monitoring will be an integral part of all timber harvest proposals.</p>	<p>This standard applies and is met. The Tenmile – South Helena project proposes to implement watershed improvement activities. As part of the proposal, design criteria and BMPs would be in place with the purpose of preventing any runoff increases.</p>

Management Standards	If Standard applies, how is standard being met
<p>Minerals – Locatable – To the extent feasible, timing of mineral activities will be coordinated with the needs of wildlife and water quality standards. This generally will require negotiations during development of operating plans for no surface occupancy, from December 1 to May 15 on winter range and during peak runoff. All minerals operations will be closely monitored to insure that water quality standards are maintained.</p> <p>- Leasable See Forest Plan Amendment #13 for lease standards</p>	<p>This standard does not apply. The Tenmile – South Helena does not propose any mineral activities or changes to existing mineral operations.</p>
<p>Lands – This management area is an avoidance area for utility corridors.</p>	<p>This standard does not apply to the Tenmile – South Helena Project.</p>
<p>Facilities – Portions of existing roads that are reconstructed will be maintained at a standard that will prevent unacceptable erosion or will be closed and stabilized.</p> <p>Roads will be constructed as needed to meet the management objectives of the area. Minimizing road width, grade and amount of disturbed area will be primary project design criteria.</p> <p>All new roads will be closed and stabilized when projects are terminated to minimize erosion.</p> <p>Where existing trails or non-system roads are intersected by new road construction, the trail or non-system road will be evaluated to determine if it should be retained on the system or abandoned.</p>	<p>This standard applies and is met. Temporary Roads would be constructed for the action alternatives to access vegetation treatment units. Design criteria incorporate road width, grade and amount of disturbed area. Temporary roads would be closed and rehabilitated after use.</p> <p>Existing roads would be maintained or reconstructed in accordance with Montana and R1 BMPs under the action alternatives.</p> <p>Evaluating roads and trail to determine if they should be retained on the system or abandoned is out of the scope of the Tenmile – South Helena project.</p>
<p>Protection - Insect and disease control should emphasize reduction and prevention through timber harvest and timber stand improvement. The use of other approved pest management techniques consistent with municipal watershed goals may be necessary at times.</p> <p>Use rapid and aggressive fire control methods in this management area. Prescribed fire may be used as a tool to reduce natural fuels and improve quantity and quality of wildlife forage.</p> <p>Fire suppression methods will be selected to minimize or eliminate soil disturbance of the watershed.</p>	<p>This standard applies and is met through removal of insect-killed trees, establishment of desirable regeneration, and improving forest health to be more resistant to bark beetle activity in the future. Insect-killed trees are proposed for removal in treatment units with all Action Alternatives.</p> <p>Fire suppression strategy will not change with any alternative.</p> <p>Prescribed burning will be used in action alternatives to improve wildlife forage. Standards will be met through the development of silvicultural prescriptions and burn plan development. Additionally, adherence to design criteria will help meet standards relating to prescribed burning.</p>
<p>Riparian – Timber harvest will be on a 240 year rotation and harvest types will generally be selection or group selection.</p>	<p>This standard applies and is met. Timber harvest is not proposed in management area H2 within riparian areas as part of the Tenmile – South Helena project.</p>
<p>Management Area L1 (1,532 acres)</p> <p>Management Goals - Maintain or improve vegetative conditions and livestock forage productivity. Optimize livestock production through intensive grazing systems, while maintaining other resource uses.</p>	

Management Standards	If Standard applies, how is standard being met
Description – These lands are within grazing allotments and are generally nonforested consisting of bunchgrasses, sage and other shrubs or sparsely forested areas with Douglas fir or ponderosa pine as the dominate species. Slopes vary from 10 percent to greater than 60. This management area contains inclusion of elk calving areas, hiding cover, and summer range, but excludes identified elk winter range.	
Recreation - Motorized and nonmotorized dispersed recreation activities are permitted and may be encouraged by constructing or maintaining trails and trailhead facilities. Existing trails and facilities will be maintained, unless they are no longer needed. - Controls on motorized recreation will be implemented where necessary to protect the vegetation, soil, water, and wildlife resources and to prevent road damage.	Not applicable to the Tenmile - South Helena Project because there are no proposals that change the travel management status on, constructs, or maintains trails.
Visual - Management practices will generally follow guidelines for the maximum modification VQO. The portions of this area (if any) that are within the sensitive viewing areas of the roads, trails, and areas listed in Appendix B will be managed to meet the more restrictive VQOs noted in the appendix. [See Forest Landscape Management Book, Vol. 2 (Ag. Hdbk. No. 462) for definitions of VQOs and how they are applied.]	Implementation of both action alternatives would be consistent with the 1986 Helena National Forest Plan. By implementing the design criteria described above, VQOs for maximum modification would be met.
Wildlife and Fisheries - Specific wildlife and fisheries needs will be identified and considered when developing allotment management plans, provided the needs are compatible with area goals. - Habitat improvement projects will be scheduled when they would help achieve the area goals.	The Tenmile – South Helena project does not propose any allotment management plans. However, watershed improvement activities are proposed as part of the project thus this standard is met.
Range - Livestock grazing will generally be maintained at or above 1983 levels, unless a range analysis or monitoring indicates there is a need to change. - Vacant allotments will be restocked if a range analysis shows it to be feasible and a demand exists for additional AUMs. - Intensive management systems will be implemented, where cost-effective, to sustain forage production. Management systems will be designed to minimize conflicts with wildlife. - Forage improvement projects such as sagebrush burning, tree encroachment burning, and noxious plant control will be carried out on a scheduled basis. The schedule will be developed as part of the allotment management plans. - Improvements, such as cattleguards, fences, and watering facilities, will be maintained and reconstructed as needed to continue present levels of grazing. New improvements may be constructed if the need is identified in an approved allotment management plan.	Not applicable because the Tenmile-South Helena Project does not propose any changes to livestock use within the project area.
Timber - Timber harvest may be used as a tool to improve forage production. However, forested land is classified as unsuitable for timber management.	This standard applies and is met. Some proposed vegetation activities along with prescribe burning are proposed in this management areas and could improve forage production.
Water and Soils – See Forest-Wide Standards.	Standard is met; see Forest-Wide Standards above.
Minerals -See Forest Plan Amendment #13 for lease standards.	This standard does not apply to the Tenmile – South Helena project because there are no current oil and gas leases present in the project area.

Management Standards	If Standard applies, how is standard being met
Lands – See Forest-Wide Standards.	See Forest-Wide standard.
Facilities - Roads normally will not be constructed for range management activities, but may be constructed for other activities, such as mining, or to provide access to adjacent management areas. When an existing barrier is intersected, the necessary structures to prevent cattle drift (fences, gates, cattleguards, etc.) will be installed during road construction. - Where existing trails are intersected by new road construction, the trail will be evaluated to determine if it should be retained on the system or abandoned.	New temporary road construction is proposed under the action alternatives to access vegetation treatment units. New temporary roads would be closed and rehabilitated after harvest activities have been completed. There are no trails that intersected any of the proposed temporary roads. This standard is met
Protection - Use prescribed fire as a tool to increase the quality and quantity of forage. - The appropriate fire suppression response ranges from control to confinement depending upon location, expected fire behavior, and other decision logic criteria related to values at risk. These decision criteria are stated in the Fire Management Direction in Appendix R. - Prescribed fire with planned ignitions will be used in this management area, for the enhancement and maintenance of resources. - Prescribed fire with unplanned ignitions may be used in this management area, for the enhancement and maintenance of resources, when within pre-established prescribed fire criteria. These criteria are detailed in the Fire Management Direction in Appendix R.	Standards will be met through the development of silvicultural prescriptions and burn plan development. Additionally, adherence to design criteria will help meet standards relating to prescribed burning. Fire suppression will still occur within established direction considering firefighter and public safety first and foremost.
Riparian – See Forest-Wide Standards.	See Forest-Wide standard.
Management Area L2 (739 acres) Management Goals - Maintain or improve range vegetative conditions and forage production for livestock and elk.	
Description - This management area is land which is both identified big game winter range and within existing grazing allotments. The land is generally non-forest with bunchgrass, sage and other shrubs or sparsely forested areas of Douglas fir and ponderosa pine. The area is usually at lower elevations in the foothills and has slopes from 10 to 60 percent. The area provides thermal and hiding cover on identified winter range.	
Recreation - Motorized access will be prohibited or limited to designated routes during wintering periods, generally from December 1 to May 15. Non-motorized dispersed recreation may be supported by constructing trails and trailhead facilities when compatible with area goals.	Not applicable to the Tenmile - South Helena Project because there are no proposals that change the travel management status of trails as well as constructs, or maintains trails.
Visual - Management practices will generally follow the guidelines for the modification VQO. The portions of this area (if any) that are within the sensitive viewing areas of the roads, trails, and areas listed in Appendix B will be managed to meet the more restrictive VQOs noted in the appendix [See Forest Landscape Management Book, Vol. 2 (Ag. Hdbk. No. 462) for definitions of VQOs and how they are applied].	Implementation of both action alternatives would be consistent with this management area. By implementing the design criteria described above, VQOs for modification would be met.

Management Standards	If Standard applies, how is standard being met
<p>Wildlife and Fisheries - Wildlife habitat improvement practices, including road management, prescribed fire, and other techniques, may be used to maintain and/or enhance the quality of big game winter range. Projects will be coordinated for livestock and big game needs.</p> <p>Maintain adequate thermal and hiding cover adjacent to forage areas. Generally this means providing at least 25 percent thermal cover, where available, on identified winter range.</p>	<p>Maintain adequate thermal and hiding cover adjacent to forage areas. Generally this means providing at least 25% thermal cover, where available, on winter range. In this management area approximately 33% of the winter range is in thermal cover. Under the Alternatives 2 and 3, this would change to 21% and 25% in Alternatives 2 and 3, respectively. A site-specific amendment would be needed to implement Alternative 2.</p>
<p>Range - Livestock grazing will be maintained at the 1983 level, however, the level may be increased or decreased if monitoring or range analysis shows a need or opportunity to change.</p> <p>Chemical or mechanical control of invading vegetation should be considered only if needed to improve or maintain forage production.</p> <p>- Forage improvement projects, such as sagebrush burning, tree encroachment burning, and noxious plant control, will be carried out on a scheduled basis. The schedule will be developed as part of the allotment management plans and in coordination with a wildlife biologist.</p> <p>When an existing barrier is intersected by structural improvements, such as cattle guards, fences, and watering facilities, will be maintained or reconstructed as needed to continue present levels of grazing. New improvements will be constructed if the need is identified in an approved allotment management plan.</p>	<p>Not applicable because the Tenmile-South Helena Project does not propose any changes to livestock use within the project area.</p>
<p>Timber - Timber harvest may be used as a tool to improve forage production. However, forested land is classified as unsuitable for timber management.</p>	<p>This standard does not apply to the Tenmile – South Helena Project because there is no timber harvest proposed in this management area.</p>
<p>Water and Soil – See Forest-Wide standards.</p>	<p>Standard is met; see Forest-Wide Standards above.</p>
<p>Minerals - Locatable—To the extent feasible, timing of mineral activities will be coordinated with the needs of wildlife on winter range. This generally will require negotiations during development of operating plans for no surface activity from December 1 to May 15.</p> <p>See Forest Plan Amendment #13 for lease standards.</p>	<p>This standard does not apply to the Tenmile – South Helena project because there are not proposals associated with mineral activities.</p>
<p>Lands – See Forest-Wide Standards.</p>	<p>See Forest-Wide Standards.</p>
<p>Facilities - Roads normally will not be constructed for range or wildlife management activities, but may be constructed for other activities, such as mining, or to provide access to adjacent management areas. The necessary structures to prevent cattle drift (fences, gates, cattle guards, etc.) will be installed during road construction.</p>	<p>This standard does not apply because there is no road construction proposed in this management area.</p>

Management Standards	If Standard applies, how is standard being met
<p>Protection - Evaluate areas periodically for significant insect and disease problems. Endemic levels will be accepted as normal. If epidemic levels develop and control is necessary, the control method should minimize impacts on big game and other wildlife values.</p> <p>The appropriate fire suppression response ranges from control to confinement depending upon location, expected fire behavior, and other decision logic criteria related to values at risk. These decision criteria are stated in the Fire Management Direction in Appendix R.</p> <p>Prescribed fire with unplanned ignitions may be used in this management area, for the enhancement and maintenance of resources, when within pre-established prescribed fire criteria. These criteria are detailed in the Fire Management Direction in Appendix R.</p> <p>Prescribed fire may be used as a tool to reduce fuels and increase the productivity of forage for wildlife and livestock.</p>	<p>This standard applies and is met through removal of insect-killed trees, establishment of desirable regeneration, and improving forest health to be more resistant to bark beetle activity in the future. Insect-killed trees are proposed for removal in treatment units with all Action Alternatives.</p> <p>Fire suppression strategy will not change with any alternative.</p> <p>Prescribed burning will be used in action alternatives to improve forage. Standards will be met through the development of silvicultural prescriptions and burn plan development. Additionally, adherence to design criteria will help meet standards relating to prescribed burning.</p>
Riparian – See Forest-Wide Standards.	See Forest-Wide Standards
<p>Management Area M1 (7,486 acres)</p> <p>Management Goals - Maintain the present condition with minimal investment for resource activities, while protecting the basic soil, water, and wildlife resources.</p>	
<p>Description – These areas are nonforested and forested land where timber management and range or wildlife habitat improvements are currently uneconomical or environmentally infeasible. The area is scattered throughout the Forest and is found at all elevations and slopes ranging from 10 percent to over 60 percent. The parcels range in size from 20 to 500 acres.</p>	
Recreation - Dispersed recreation can be supported by constructing trails, trailhead facilities, and sanitation facilities.	Not applicable because the Tenmile - South Helena Project does not propose the construction of trails, trailhead facilities, and sanitation facilities.
Visual - Because of the lack of activity, the general visual quality objective (VQO) is retention. Less restrictive VQOs may be considered on a case-by-case basis, if project level planning on an adjacent management area affects a M-1 management area. [See Forest Landscape Management Book, Vol. 2 (Ag. Hdbk. No. 462) for definitions of VQOs and how they are applied.]	<p>Implementation of both action alternatives would be consistent with this management area. By implementing the design criteria described above, VQOs for retention would be met.</p> <p>Proposed landings, temporary roads, skyline corridors, and, skid trails in areas with VQO's of retention and partial retention would meet VQO standards but not immediately upon implementation of activities. However, design criteria would minimize any short-term negative impacts and will result in long-term positive effects to the scenic quality of the project area.</p>
Wildlife and Fisheries - Management practices to maintain or improve wildlife habitat will be permitted where necessary to meet the objectives of adjacent management areas.	This standard applies and is met. Watershed improvement activities are proposed for the project which would potentially have a beneficial effect on aquatic resources. Management practices are consistent with this management area.
Range - Livestock use may remain at the 1983 level if the area is within existing allotments. Maintain range improvements and build new improvements, if they are needed to facilitate management of adjacent areas.	Not applicable because the Tenmile-South Helena Project does not propose any changes to livestock use within the project area.

Management Standards	If Standard applies, how is standard being met
Timber - Timber harvest, such as salvage and firewood removal, may occur where access exists. Slash created by any management practice will be disposed of in a manner consistent with the management area goals. Forested lands are classified as unsuitable for timber management.	No timber harvest proposed in this management area. Slash created by the rearrangement of fuels will be disposed of in a variety of ways consistent with this management area. See Fire and Fuels report for additional information.
Facilities - Roads will be allowed for special uses, mineral development, or to provide access to other management areas, consistent with protection of soil and water values. Roads may be opened or closed, depending on the objectives of the adjacent management areas. - Existing roads and trails will be maintained as needed.	Roads are not proposed in the management area for the project. The Existing road network used for implementation activities would be maintained or reconstructed. Trail maintenance is not proposed as part of this project.
Minerals – See Forest Plan Amendment #13 for lease standards.	This standard does not apply because there are no proposals associated with this project associated with mineral activities.
Protection - Salvage of dead, dying, or high-hazard trees is permitted to prevent disease and insect population build-up. - The appropriate fire suppression response ranges from control to confinement depending upon location, expected fire behavior, and other decision criteria related to values at risk. These criteria are stated in the Fire Management Direction in Appendix R. - Prescribed fire with planned ignitions may be used in this management area, for the enhancement and maintenance of resources. - Prescribed fire with unplanned ignitions may be used in this management area, for the enhancement and maintenance of resources, when within preestablished prescribed fire criteria. These criteria are stated in the Fire Management Direction in Appendix R. - Evaluate areas periodically for significant insect and disease problems. Endemic levels will be accepted as normal. If epidemic levels develop and control is necessary, the control method should minimize impacts on watershed and other resource values.	This standard applies and is met. Part of the purpose and need for this project includes salvage of insect-killed trees, establishing desirable regeneration, and improving forest health to be more resistant and resilient to bark beetle activity in the future. Insect-killed and currently infested trees are proposed for removal in harvest units with all Action Alternatives.
Management Area R1 (4,217 acres) Management Goals - Provide a variety of semi-primitive and primitive nonmotorized recreation opportunities. Provide for maintenance and/or enhancement of fishery, big game, and nongame habitat, grazing allotments, visual quality, and water quality	
Description – This management area consists of large blocks – greater than 3,000 acres – of undeveloped Land suited for dispersed recreation. These Lands include Mount Helena, Trout Creek Canyon, Indian Meadows, Nevada Mountain, Camas Lakes, and Silver King/Falls Creek. The Silver King/Falls Creek area has been identified by the USGS as having a high potential for oil and gas. These areas provide opportunities for semi-primitive non-motorized recreation and are characterized predominately by natural or natural appearing environment where there is a high probability of isolation from man's activities.	
Recreation Motorized vehicles are not allowed in the management area. Exceptions may be allowed on a case-by-case basis where motorized vehicles are needed for legitimate mineral use. - Recreation facilities will be permitted to preserve or enhance dispersed recreation opportunities. Portals, shelters, toilets, trail signs, etc., may be constructed if a need is identified. Existing facilities may be maintained or reconstructed as needed to expand dispersed recreation opportunities. - Developed campgrounds will not be constructed in this area.	Not applicable to the Tenmile - South Helena Project because there are no proposals to change the travel management status of routes, construct, or maintain trails. The development, maintenance, or construction of campgrounds and other recreation facilities are not proposed as part of this project.

Management Standards	If Standard applies, how is standard being met
Visual - Management practices will follow the guidelines for the retention VQO. Short term deviations may occur during construction or reconstruction of facilities or from management activities. [See Forest Landscape Management Book, Vol. 2 (Ag. Hdbk, No. 462) for definitions of VQOs and how they are applied.]	Implementation of both action alternatives would be consistent with this management area. By implementing the design criteria described above, VQOs for retention would be met. Proposed landings, temporary roads, skyline corridors, and, skid trails in areas with VQO's of retention and partial retention would meet VQO standards but not immediately upon implementation of activities. However, design criteria would minimize any short-term negative impacts and will result in long-term positive effects to the scenic quality of the project area.
Wildlife and Fisheries – Habitat improvement projects, such as prescribed fire and water developments, may be used to maintain or improve the fish and wildlife habitat, if the projects are compatible with the area's goals.	Prescribe fire is proposed on units within this management area and would improve forest health to be more resistant to bark beetle activity in the future which would have a potential beneficial effect to wildlife habitat
Range - Livestock grazing will be maintained at the 1983 levels within existing allotments, however, the level may be increased or decreased if monitoring or range analysis shows a need or opportunity to change. -Range improvements, such as salting, water developments, etc., may be implemented to disperse livestock use.	Not applicable because the Tenmile-South Helena Project does not propose any changes to livestock use within the project area.
Timber - Forested lands are classified as unsuitable for timber management.	This standard for the Tenmile – South Helena project is met because there is no timber harvest proposed within this management area.
Water and Soils – See Forest-Wide Standard.	Standard is met, see Forest-Wide Standards above.
Minerals – Locatable – Maintain an unroaded environment to the extent practical under the mining laws and the Mining Act Use Regulations. Use of motorized vehicles and timing of mineral activities will be coordinated with dispersed recreation and wildlife needs during development of the operating plan. -Leasable See Forest Plan Amendment #13 for lease standards	This standard does not apply to the Tenmile – South Helena project because there are no proposed mineral activities or associated road construction associated with the project.
Lands – This management area is an avoidance area for utility corridors (see Appendix P).	This standard does not apply because the Tenmile – South Helena project does not proposed any utility corridors.
Facilities – Roads will not be constructed for surface management purposes unless absolutely necessary for mineral activity or to access private land. -Trailhead facilities may be constructed to increase accessibility and enhance recreation opportunities.	This standard applies and is met. The Tenmile – South Helena project does not proposed any road construction or trailhead facilities in this management acres.

Management Standards	If Standard applies, how is standard being met
<p>Protection - Evaluate areas periodically for significant insect and disease problems. Endemic levels will be accepted as normal. If epidemic levels develop and control is necessary, the control method should minimize impacts on the dispersed recreation values.</p> <ul style="list-style-type: none"> - Wildfire suppression should minimize the use of heavy equipment. - The appropriate fire suppression response ranges from control to confinement depending upon location, expected fire behavior, and other decision criteria related to values at risk. These decision criteria are stated in the Fire Management Direction in Appendix R. - Prescribed fire with planned ignitions may be used in this management area, for the enhancement and maintenance of resources. - Prescribed fire with unplanned ignitions may be used in this management area, for the enhancement and maintenance of resources, when within preestablished prescribed fire criteria. These criteria are detailed in the Fire Management Direction in Appendix R. 	<p>This standard applies and is met through removal of insect-killed trees, establishment of desirable regeneration, and improving forest health to be more resistant to bark beetle activity in the future. Insect-killed trees are proposed for removal in treatment units with all Action Alternatives.</p> <p>Fire suppression strategy will not change with any alternative.</p> <p>Prescribed burning will be used in action alternatives to improve forage. Standards will be met through the development of silvicultural prescriptions and burn plan development. Additionally, adherence to design criteria will help meet standards relating to prescribed burning.</p>
Riparian – See Forest Wide Standards	See Forest-Wide Standards
<p>Management Area T1 (9,059 acres)</p> <p>Management Goals - Provide healthy timber stands and optimize timber growing potential over the planning horizon. Emphasize cost-effective timber production, while protecting the soil productivity. Maintain water quality and stream bank stability. Provide for dispersed recreation opportunities, wildlife habitat, and livestock use, when consistent with the timber management goals.</p> <p>Description - This management area consists of lands available and suitable for timber management with varying physical and biological environments as determined by soil, slope, aspect, elevation, and climatic factors. Vegetation varies from ponderosa pine on the drier sites to spruce in the more mesic sites with nearly all slopes and aspects represented. Although this area consists primarily of suitable forest land, there are inclusions of nonforest and nonproductive forest lands. This area includes some small ponds and marshes which are considered unique to this part of Montana.</p>	
<p>Recreation - Motorized and non-motorized dispersed recreation activities are permitted and may be supported by constructing or maintaining trails and trailhead facilities. Existing trails and facilities will be maintained unless they are no longer needed. - Controls on motorized recreation will be implemented where necessary, to protect the vegetation, soil, and water resources and to prevent road damage.</p>	Not applicable to the Tenmile - South Helena Project because there are no proposals to change the travel management status of routes, construct, or maintain trails.
<p>Visual - Management practices will generally follow guidelines for the maximum modification VQO. The portions of this area (if any) that are within the sensitive viewing areas of the roads, trails, and areas listed in Appendix B will be managed to meet more restrictive VQOs noted in the appendix. [See Forest Management Book, Vol. 2 (Ag. Hdbk, No. 462) for definitions of VQOs and how they are applied.]</p>	Implementation of both action alternatives would be consistent with this management area. By implementing the design criteria described above, VQOs for maximum modification retention would be met.
<p>Wildlife and Fisheries - Wildlife and fisheries habitat improvement projects may be implemented, provided they are compatible with the management area goals.</p> <p>Forest-Wide Standards and Appendix D contain guidance for T&E species habitat.</p>	Wildlife and fisheries habitat improvements as a result of proposed treatments in this MA have been identified. Refer to the Wildlife and Fisheries Specialist reports. Refer to the T&E section under Forest-Wide Standards for more information. This standard is met.

Management Standards	If Standard applies, how is standard being met
<p>Range - Livestock grazing is compatible, except where it conflicts with stand establishment. Fencing, temporary herding, or other techniques may be used to protect regeneration where needed.</p> <p>Pasture and allotment boundaries should be maintained during and following timber harvest. This may require additional fencing, where natural barriers are breached by timber sale activities.</p> <p>Livestock grazing will be maintained at the 1983 levels within existing allotments, however, the level may be increased or decreased if monitoring or range analysis shows a need or opportunity to change.</p>	<p>This standard applies and is met. The design criterion for the project incorporates this standard.</p>
<p>Timber - This management area is suitable for timber management activities. Timber harvest practices include clearcut, group selection, and shelterwood harvest, depending on habitat group, physical site conditions, and silvicultural objectives. Precommercial thinning and intermediate harvest may occur where needed as determined by silvicultural objectives and project planning. (Appendices H and M provide broad guidelines for various habitat groups.)</p> <p>As a minimum, a cutover area will not be considered an opening when: (1) a new forest stand is established and certified as stocked, and (2) vegetative conditions reach the point where harvest of additional timber can occur and the combined area can still meet watershed management objectives.</p> <p>Prescribed burning or other techniques may be used for slash disposal, site preparation, silvicultural, and livestock objectives. In habitat groups where fire is not a useful treatment tool, logging and scattering, yarding unmerchantable material (YUM), or other methods will be used to reduce fuel accumulations and prepare sites for regeneration.</p> <p>Project level planning will provide for stand regeneration within five years of final harvest.</p> <p>Even-aged stands will be scheduled for final regeneration harvest when they generally have reached the culmination of mean annual increment (CMAI) of growth. Exceptions include thinning or other stand improvement measures, salvage or sanitation harvest, management for experimental or research purposes and to meet other resource objectives. CMAI for primary species on the Helena National Forest is shown in Appendix H.</p>	<p>Alternative 1, the No Action Alternative does not provide for healthy stands or optimize growth. The standard applies to Action Alternatives and is met. Timber management under Alternative 2 provides 6,543 of healthy timber stands. Regeneration units have reached CMAI. Timber management under Alternative 3 provides 4,277 acres of healthy timber stands. Regeneration units have reached CMAI.</p>
<p>Water and Soils</p> <p>Timber harvest will not create runoff increases which are likely to result in long term stream channel degradation. All timber sale proposals will include an analysis of the current and projected status of sediment produced. The project proposal will analyze and evaluate the potential water quantity and quality, and soil productivity impacts; mitigation measures should be developed to minimize adverse effects. If a proposal shows the water quality cannot be maintained, the project will be reevaluated or terminated.</p>	<p>This standard applies and is met. Chapter 3 of the DEIS discloses the analysis for hydrology and soil resources. Analysis includes current and projected sediment production; potential water quantity and quality, and soil productivity impacts; and mitigation measures have been developed to minimize adverse effects.</p>
<p>Minerals – Locatable – See Forest-Wide Standards. Leasable See Forest Plan Amendment #13 for lease standards</p>	<p>This standard does not apply to the Tenmile – South Helena project because the project proposal does not include mineral activities.</p>

Management Standards	If Standard applies, how is standard being met
Lands – See Forest-Wide Standards	See Forest Wide Standard.
<p>Facilities - Roads will be constructed as needed to meet the management objectives of the area.</p> <p>Where existing trails are intersected by new road construction, the trail will be evaluated to determine if it should be retained on the system or abandoned.</p>	This standard applies and is met. New temporary road construction is proposed under the action alternatives in this management area to access vegetation treatment units and remove fuel. New temporary roads would be closed and decommissioned after harvest activities are completed.
<p>Protection</p> <p>Insect and disease control should emphasize reduction and prevention through timber harvest and timber stand improvement. The use of other approved integrated pest management techniques may be necessary at times.</p> <p>The appropriate fire suppression response ranges from control to containment depending upon location, expected fire behavior, and other decision logic criteria related to values at risk. These decision criteria are stated in the Fire Management Direction in Appendix R.</p> <p>Prescribed fire with planned ignitions may be used in this management area, for the enhancement and maintenance of resources.</p> <p>Fuel reduction methods for activity created fuels include burning, removing residue, or rearranging, such as dozer trampling.</p>	<p>Standard does not apply to No Action, but does apply to the Action Alternatives and is met. Proposed harvest would respond to insect-caused mortality and lower the hazard of future insect problems within treatment units. Prescribed fire would be used to reduce natural fuels. Refer to Forested Vegetation Specialist Report.</p> <p>Prescribed burning will be used in action alternatives to improve forage. Standards will be met through the development of silvicultural prescriptions and burn plan development. Additionally, adherence to design criteria will help meet standards relating to prescribed burning.</p>
<p>Riparian - Generally, harvesting will only occur in riparian areas in conjunction with sale activity on adjacent lands.</p> <p>In riparian areas, any timber harvest should be on a 240 year rotation, and harvest types should be selection or group selection.</p> <p>See Forest Wide Standards for grazing in riparian.</p> <p>The small ponds and marshes in Section 15, 16, 21, and 22 of T8N, R6W PMM are unique to this part of Montana and will be protected in project design and implementation.</p>	Standard does not apply to the No Action, but does apply to the action alternatives and is met. Riparian best management practices would be followed.
<p>Management Area T3 (265 acres)</p> <p>Management Goals - Maintain and/or enhance habitat characteristics favored by elk and other big game species. Provide for healthy timber stands and a timber harvest program compatible with wildlife habitat goals for this area. Emphasize cost-effective timber production, while protecting the soil productivity. Maintain water quality and stream bank stability. Provide for other resource objectives where compatible with the big game summer range and timber goals.</p>	
<p>Description - This management area consists of lands that have primary forage, resting, and security characteristics that provide important spring and summer requirements for all big game species. These lands also supply the habitat needs of a wide variety of nongame forest dwelling wildlife. In addition lands within this management area contain productive timber sites that are available and suitable for timber management. The variation in elevation, topography, slope, and aspect, in addition to the often abundant surface water (seeps, springs, etc.), make these areas rich in species diversity and total numbers within species groups. This area also has inclusions of small grassland parks.</p>	
<p>Recreation - Controls over motorized dispersed recreation will be implemented where necessary to protect wildlife habitat values.</p> <p>Nonmotorized dispersed recreation may be supported by constructing trails and trailhead facilities when compatible with management area goals.</p>	There are no proposals that change the travel management status of routes, construct, or maintain trails. Control measures on motorized recreation would be implemented as a result of decommissioning of unauthorized roads in the project area. This standard is met.

Management Standards	If Standard applies, how is standard being met
<p>Visual - Management practices will generally follow guidelines for the modification VQO. The portions of this area (if any) that are within the sensitive viewing areas of the roads, trails, and areas listed in Appendix B will be managed to meet the more restrictive VQOs noted in the appendix. [See Forest Landscape Management Book, Vol. 2 (Ag. Hdbk. No. 462) for definitions of VQOs and how they are applied.]</p>	<p>Implementation of both action alternatives would be consistent with this management area. By implementing the design criteria described above, VQOs for modification would be met.</p>
<p>Wildlife and Fisheries - Maintain a minimum of 35 percent hiding cover for big game. Maintain thermal cover adjacent to forage areas. Appendix C provides guidance for thermal cover. Wildlife habitat improvement practices, including road management, prescribed fire, and timber harvest, may be used to maintain and/or enhance the quality of big game summer habitat.</p>	<p>(1) <i>Maintain thermal cover adjacent to forage areas.</i> There are broad parks adjacent to thermal cover in this management area. Treatment effects would vary, from substantial cover reductions associated with improvement cuts to more cover retention in prescribed fire units. Thermal cover would not be retained adjacent to all forage areas in T-3. Therefore a site-specific amendment would be needed to implement either action alternative.</p> <p>(2) <i>Maintain a minimum of 35 percent hiding cover for big game.</i> There are 211 acres of hiding cover (80%) in this management area in the existing condition. Alternative 2 would treat all of those acres; Alternative 3 would also treat all 211 acres although 41 of those acres would be treated with precommercial thinning which is designed to retain hiding cover in Alternative 3. There would be <1% and 17% hiding cover remaining in Alternatives 2 and 3 respectively. A site-specific amendment would be needed to implement either action alternative.</p> <p>(3) <i>Wildlife habitat improvement practices, including road management, prescribed fire, and other techniques, will be used to maintain and/or enhance the quality of big game summer habitat.</i> The project is designed to improve forage conditions. Prescribed fire goals include improving grass and shrublands as well as promoting open grown forests that are beneficial to elk and deer.</p> <p>(4) <i>Openings created by timber harvest will be reforested to the extent necessary to meet the hiding cover requirements of big game before harvesting adjacent areas.</i> Timber harvest is proposed in T-3; however, past timber harvest within T-3 is currently providing hiding cover.</p>
<p>Range - Livestock grazing will be maintained at the 1983 levels within existing allotments, however, the level may be increased or decreased if monitoring or range analysis show a need or opportunity to change. Grazing systems will be designed to be compatible with wildlife needs. Improvements for livestock management, such as fencing and water developments, will be implemented unless they are a detriment to big game.</p>	<p>Not applicable because the Tenmile-South Helena Project does not propose any changes to livestock use within the project area.</p>

Management Standards	If Standard applies, how is standard being met
<p>Timber - This management area is suitable for timber management activities. Timber harvest methods and volumes may be modified as necessary to achieve the management area goals.</p> <p>Even-aged stands will be scheduled for final regeneration harvest when they generally have reached the culmination of mean annual increment (CMAI) of growth. Exceptions include salvage or sanitation harvest and management for experimental or research purposes and to meet other resource objectives. CMAI for primary species on the Helena National Forest is shown in Appendix H. Appendix M provides guidance for various vegetative management practices by habitat group.</p> <p>Stocking control may be maintained through pre-commercial and commercial thinning. The timing and planning of thinning operations will be coordinated with a wildlife biologist.</p> <p>Vegetative diversity will be encouraged.</p> <p>Openings created by timber harvest will be reforested to the extent necessary to meet the hiding cover requirements of big game before harvesting adjacent areas.</p>	<p>Alternative 1, the No Action Alternative does not provide for healthy stands or vegetative diversity. Timber management in Alternative 2 increases vegetative diversity and provides for healthy timber stands. See the above Fisheries and Wildlife standard for this management area for Timber management and wildlife habitat goals.</p>
<p>Water and Soils - Timber harvest will not create runoff increases which are likely to result in long term channel degradation. All timber sale proposals will include an analysis of the current and projected status of sediment produced. The project proposal will analyze and evaluate the potential water quantity and quality and soil productivity impacts; mitigation measures should be developed to minimize adverse effects. If a project proposal shows the water quality cannot be maintained, the project will be reevaluated or terminated.</p>	<p>This standard applies and is met. Chapter 3 of the DEIS discloses the analysis for hydrology and soil resources. Analysis includes current and projected sediment production; potential water quantity and quality, and soil productivity impacts; and mitigation measures have been developed to minimize adverse effects.</p>
<p>Minerals - Locatable—To the extent feasible, timing of activities will be coordinated with the needs of wildlife on summer range. This will require negotiations during development of operating plans for minimum disturbance to wildlife.</p> <p>Leasable ---- See Forest Plan Amendment #13 for lease standards</p>	<p>This standard does not apply to the Tenmile – South Helena project because the project does not propose any changes to mineral activities.</p>
<p>Lands – See Forest-Wide Standards</p>	<p>See Forest-Wide Standards</p>
<p>Facilities - Roads will be constructed as needed to meet the management area goals.</p> <p>Where existing trails are intersected by new road construction, the trail will be evaluated to determine if it should be retained on the system or abandoned.</p>	<p>New temporary road construction is proposed under the action alternatives to access vegetation treatment units. New temporary roads would be closed and rehabilitated after use. This standard is met.</p>

Management Standards	If Standard applies, how is standard being met
<p>Protection - Insect and disease control should emphasize reduction and prevention through timber harvest and timber stand improvement. The use of other approved integrated pest management techniques may be necessary at times.</p> <p>The appropriate fire suppression response ranges from control to containment depending upon location, expected fire behavior, and other decision criteria related to values at risk. These decision criteria are stated in the Fire Management Direction in Appendix R.</p> <p>Prescribed fire with planned ignitions may be used in this management area, for the enhancement and maintenance of resources.</p> <p>Fuel reduction methods for activity created fuels include burning, removing residue, or rearranging, such as dozer trampling. Disposal activities will meet visual quality objectives.</p>	<p>Standard does not apply to No Action, but does apply to the Action Alternatives and is met. Proposed harvest would respond to insect-caused mortality and lower the hazard of future insect problems within treatment units. Prescribed fire would be used to reduce natural fuels. Refer to Forested Vegetation Specialist Report.</p> <p>Standards will be met through the development of silvicultural prescriptions and burn plan development. Additionally, adherence to design criteria will help meet standards relating to prescribed burning.</p>
<p>Riparian - See Forest Wide Standards for grazing in riparian. Generally, harvesting will only occur in riparian areas if in conjunction with sale activity on adjacent lands.</p> <p>In riparian areas, any timber harvest should be on a 240 year rotation and harvest types should be selection or group selection.</p>	<p>This standard applies and is met for the Tenmile – South Helena project. The project does not propose any changes to grazing activities. Riparian best management practices would be followed.</p>
<p>Management Area T4 (1,040 acres)</p> <p>Management Goals - Maintain healthy stands of timber within the visual quality objective of retention and partial retention. Provide for other resource uses as long as they are compatible with visual quality objectives. Emphasize cost-effective timber production, while protecting the soil productivity. Maintain water quality and stream bank stability.</p>	
<p>Description - This management area is productive timberland within the sensitive viewing area of many major travel routes, use areas, and water bodies. Vegetation varies from ponderosa pine, on the drier sites, to spruce in the moistest areas. Nearly all slopes and aspects are represented. Most of the area is suitable forest land, but there are some inclusions of nonforest and nonproductive forest land.</p>	
<p>Recreation – Motorized and non-motorized dispersed recreation activities are permitted and may be supported by constructing or maintaining trails and trailhead facilities.</p> <p>Controls over motorized recreation will be implemented where necessary to protect resource values such as vegetation, soil, water, and VQOs.</p>	<p>This standard applies and is met for the Tenmile - South Helena Project because there are no proposals that would change the travel management status of routes, construct, or maintain trails. However, design criteria to control motorized recreation associated with project activities would be followed.</p>
<p>Visual – Management practices will generally follow guidelines for partial retention and retention depending upon the particular portion of the management area being entered. (Refer to Appendix B, Sensitive Viewing Areas, for most heavily used roads and recreation areas.) Departures from these VQOs will be considered on a case-by-case basis after an environmental analysis has been completed. [See Forest Landscape Management Book, Vol. 2 (Ag. Hdbk. No. 462) for definitions of VQOs and how they are applied.]</p>	<p>Implementation of both action alternatives would be consistent with this management area. By implementing the design criteria described above, VQOs for partial retention and retention would be met.</p> <p>Proposed landings, temporary roads, skyline corridors, and, skid trails in areas with VQO's of retention and partial retention would meet VQO standards but not immediately upon implementation of activities. However, design criteria would minimize any short-term negative impacts and will result in long –term positive effects to the scenic quality of the project area.</p>

Management Standards	If Standard applies, how is standard being met
<p>Wildlife and Fisheries – Where elk habitat exists, project design will incorporate management practices to maintain or enhance summer and winter habitat to the extent that the VQOs for the area are met.</p> <p>-Wildlife and fisheries habitat improvement projects may be implemented, provided they are compatible with the management area goals.</p>	<p>This standard applies and is met. Some treatment would occur in this management area and would be consistent with VQOs.</p>
<p>Range – Pasture and allotment boundaries should be maintained during and following timber harvest. This may require additional fencing where natural barriers are breached by timber sale activities.</p> <p>Livestock grazing will be maintained at the 1983 levels within existing allotments, however, the level may be increased or decreased if monitoring or range analysis show a need or opportunity to change.</p>	<p>Not applicable because the Tenmile-South Helena Project does not propose any changes to livestock use within the project area.</p>
<p>Timber - This management area is suitable for timber management activities. Even-aged stands may be scheduled for final regeneration harvest when they generally have reached the culmination of mean annual increment (CMAI) of growth. Exceptions include thinning or other stand improvement measures, salvage or sanitation harvest, and management for experimental or research purposes and to meet other resource objectives. CMAI for primary species on the Helena National Forest is shown in Appendix H.</p> <p>Timber harvest practices include clearcutting, group selection, and shelterwood harvest, depending on habitat group, physical site conditions, and visual quality objectives. Precommercial thinnings and intermediate harvest will occur where needed as determined by silvicultural objectives, project planning, and visual quality objective. (Appendices H and M provide broad guidelines for various habitat groups.)</p> <p>Openings created by timber harvest will be reforested to the point where harvest of adjacent timber can occur and the combined area can still meet the VQOs of the area.</p> <p>Use timber harvest to rehabilitate existing harvest units, to improve the VQO. Prescribed burning will be used to accomplish slash disposal, site preparation, and silvicultural objectives. In habitat groups where fire is not a useful treatment tool, loping and scattering, YUM yarding, or other methods will be used to reduce fuel accumulations and prepare sites for regeneration provided the area goals are met.</p>	<p>Alternative 1, the No Action Alternative does not provide for healthy stands of timber. Timber management in Alternative 2 maintains healthy timber stands within visual quality objectives. Timber management in Alternative 3 maintains healthy timber stands within visual quality objectives.</p>
<p>Water and Soils - Timber harvest will not create runoff increases which are likely to result in long term channel degradation. All timber sale proposals will include an analysis of the current and projected status of sediment produced. The project proposal will analyze and evaluate the potential water quantity and quality and soil productivity impacts; mitigation measures should be developed to minimize adverse effects. If a project proposal shows the water quality can not be maintained, the project will be reevaluated or terminated.</p>	<p>This standard applies and is met. Chapter 3 of the DEIS discloses the analysis for hydrology and soil resources. Analysis includes current and projected sediment production; potential water quantity and quality, and soil productivity impacts; and mitigation measures have been developed to minimize adverse effects.</p>
<p>Minerals - Locatable—Plans of operation will include measures to maintain the VQO of the area.</p> <p>Leasable ---- See Forest Plan Amendment #13 for lease standards</p>	<p>This standard does not apply to the Tenmile – South Helena project because the project does not propose any changes to mineral activities.</p>

Management Standards	If Standard applies, how is standard being met
Lands – See Forest-Wide Standards.	See Forest-Wide Standards
Facilities - Roads will be constructed as needed to meet the management objectives of the area.. Where existing trails are intersected by new road construction, the trail will be evaluated to determine if it should be retained on the system or abandoned.	This standard is met. New temporary road construction is proposed under the action alternatives to access vegetation treatment units. New temporary roads would be closed and rehabilitated after use.
Protection - Insect and disease control should emphasize reduction and prevention through timber harvest and timber stand improvement. The use of other approved integrated pest management techniques may be necessary at times. Aggressive control will normally be the appropriate fire suppression response in this management area. Prescribed fire with planned ignitions will be used in this management area, for the enhancement and maintenance of resources. Fuel reduction methods for activity created fuels include burning, removing residue, or rearranging, such as dozer trampling. Disposal activities will meet visual quality objectives. Wildfires will be suppressed in a manner that minimizes the use of heavy equipment.	Standard does not apply to No Action, but does apply to the Action Alternatives and is met. Proposed harvest would respond to insect-caused mortality and lower the hazard of future insect problems within treatment units. Prescribed fire would be used to reduce natural fuels. Refer to Forested Vegetation Specialist Report. Standards will be met through the development of silvicultural prescriptions and burn plan development. Additionally, adherence to design criteria will help meet standards relating to prescribed burning.
Riparian - See Forest Wide Standards for grazing in riparian. Generally, harvesting will only occur in riparian areas if in conjunction with large scale activity on adjacent lands. In riparian areas, any timber harvest should be on a 240 year rotation and harvest types should be selection or group selection.	This standard applies and is met for the Tenmile – South Helena project. The project does not propose any changes to grazing activities. Riparian best management practices would be followed.
Management Area T5 (5,263 acres)	
Management Goals - Increase production and quality of forage. Manage timber sites cost-effectively, by selecting the most economical harvest system and managing for natural regeneration. Provide for healthy stands of timber and timber products consistent with increasing quality and quantity of forage. Emphasize cost-effective timber production, while protecting the soil productivity. Maintain water quality and stream bank stability. Provide for other resource uses that are compatible with the other goals.	
Description - This management area consists of suitable timber stands interspersed with natural openings, generally with existing livestock allotments. Forage is provided by natural meadows and transitory range. The area consists of mostly Douglas-fir, with some lodgepole pine. It encompasses lower elevations and dry sites on the Forest usually on the fringes of native grasslands.	
Recreation – Motorized and non-motorized dispersed recreation activities are permitted and may be supported by constructing or maintaining trails and trailhead facilities. Existing trails and facilities will be maintained unless they are no longer needed. Controls over motorized recreation will be implemented where necessary to protect the vegetation, soil, water, and wildlife resources and to prevent road damage.	Not applicable to the Tenmile - South Helena Project because there are no proposals that would change the travel management status of routes, construct, or maintains trails.

Management Standards	If Standard applies, how is standard being met
<p>Visual – Management practices will generally follow guidelines for the modification VQO. The portions of this area (if any) that are within the sensitive viewing areas of the roads, trails, and areas listed in Appendix B will be managed to meet the more restrictive VQOs noted in the appendix. [See Forest Landscape Management Book, Vol. 2 (Ag. Hdbk. No. 461) for definitions of VQOs and how they are applied.]</p>	<p>Implementation of both action alternatives would be consistent with this management area. By implementing the design criteria described above, VQOs for modification would be met.</p>
<p>Wildlife and Fisheries – Wildlife and fisheries habitat improvement projects may be implemented, provided they are compatible with the management area goals.</p> <p>Maintain adequate thermal and hiding cover adjacent to forage areas, provided timber harvest volumes are not significantly reduced over the rotation period.</p>	<p>The action alternatives include treatments that would increase fragmentation; however, these open forests should provide a mix of forage and shade during the summer for big game. All of the action alternatives are consistent with these standards in terms of maintaining and/or enhancing big game habitat.</p>
<p>Range – Livestock grazing will generally be maintained at or above 1983 levels, unless a range analysis indicates there is a need to change. Vacant allotments will be restocked if a range analysis shows it to be feasible and a demand exists.</p> <p>Transitory range resulting from timber harvest will be integrated into the allotment planning process.</p> <p>Intensive management systems will be implemented, where cost-effective, to develop the range resource for sustained forage production. Management systems will be designed to minimize conflicts with wildlife.</p> <p>Forage improvement projects such as sagebrush burning, tree encroachment burning, and noxious plant control may be carried out on a scheduled basis. The schedule will be developed as part of allotment plans.</p> <p>Existing structural improvements, such as cattle guards, fences, and watering facilities, will be maintained or reconstructed as needed to continue present levels of grazing. Additional improvements may be built if the need is identified in an approved allotment management plan.</p>	<p>Not applicable because the Tenmile-South Helena Project does not propose any changes to livestock use within the project area.</p>

Management Standards	If Standard applies, how is standard being met
<p>Timber - This management area is suitable for timber management. Timber harvest methods include clearcutting, group selection, and shelterwood harvest, but may be modified to favor forage production. Clearcuts will be designed to ensure natural regeneration. Appendix M provides guidance for various vegetative management practices in the habitat groups on the Forest. Regeneration will be by natural means and will occur within 5 years of final harvest.</p> <p>As a minimum, a cutover area will not be considered an opening when: (1) a new forest stand is established and certified as stocked, and (2) vegetative conditions reach the point where harvest of additional timber can occur and the combined area can still meet watershed management objectives. Final entry of a shelterwood harvest may be delayed up to four decades to provide transitory range and to ensure regeneration.</p> <p>Animal control may be required on a case by case basis to ensure regeneration within 5 years of final harvest.</p>	<p>Alternative 1, the No Action Alternative does not maintain timber site cost effectively. Timber management under Alternative 2 is effective for long-term cost and the future ability to manage the timber stands. Timber management under Alternative 3 is effective for long-term cost and the future ability to manage the timber stands. This standard is met.</p>
<p>Water and Soils - Timber harvest will not create runoff increases which are likely to result in long term channel degradation. All timber sale proposals will include an analysis of the current and projected status of sediment produced. The project proposal will analyze and evaluate the potential water quantity and quality and soil productivity impacts; mitigation measures should be developed to minimize adverse effects. If a project proposal shows the water quality can not be maintained, the project will be reevaluated or terminated.</p>	<p>This standard applies and is met. Chapter 3 of the DEIS discloses the analysis for hydrology and soil resources. Analysis includes current and projected sediment production; potential water quantity and quality, and soil productivity impacts; and mitigation measures have been developed to minimize adverse effects.</p>
<p>Minerals - Locatable—See Forest-Wide Standards. Leasable ---- See Forest Plan Amendment #13 for lease standards</p>	<p>This standard does not apply to the Tenmile – South Helena project because the project does not propose any changes to mineral activities.</p>
<p>Lands – See Forest-Wide Standards.</p>	<p>See Forest-Wide Standards.</p>
<p>Facilities - Roads will be constructed as needed to meet the management area goals. Where existing trails are intersected by new road construction, the trail will be evaluated to determine if it should be retained on the system or abandoned.</p>	<p>New temporary road construction is proposed under the action alternatives, to access vegetation treatment units. New temporary roads would be closed and rehabilitated after use.</p>

Management Standards	If Standard applies, how is standard being met
<p>Protection - Insect and disease control should emphasize reduction and prevention through timber harvest and timber stand improvement. The use of other approved integrated pest management techniques may be necessary at times.</p> <p>The appropriate fire suppression response ranges from control to containment in this management area depending upon location, expected fire behavior, and other decision criteria related to values at risk. These decision criteria are stated in the Fire Management Direction in Appendix R.</p> <p>Prescribed fire with planned ignitions may be used in this management area, for the enhancement and maintenance of resources.</p> <p>Prescribed fire with planned ignitions may be used in this management area, for the enhancement and maintenance of resource, when within pre-established prescribed fire criteria. These criteria are detailed in the Fire Management Direction in Appendix R.</p> <p>Fuel reduction methods for activity created fuels include burning, removing residue, or rearranging, such as dozer tramplng.</p>	<p>Standard does not apply to No Action, but does apply to the Action Alternatives and is met. Proposed harvest would respond to insect-caused mortality and lower the hazard of future insect problems within treatment units. Prescribed fire would be used to reduce natural fuels. Refer to Forested Vegetation Specialist Report.</p> <p>Standards will be met through the development of silvicultural prescriptions and burn plan development. Additionally, adherence to design criteria will help meet standards relating to prescribed burning.</p>
<p>Riparian - Generally, harvesting will only occur in riparian areas in conjunction with sale activity on adjacent lands.</p> <p>In riparian areas, any timber harvest should be on a 240 year rotation and harvest types should be selection or group selection.</p> <p>See Forest Wide Standards for grazing in riparian.</p>	<p>This standard applies and is met for the Tenmile – South Helena project. The project does not propose any changes to grazing activities. Riparian best management practices would be followed.</p>
<p>Management Area W1 (1,412 acres)</p> <p>Management Goals - Optimize wildlife habitat potential, including old growth, over the long term. Provide for other resource uses, if they are compatible with wildlife management goals.</p>	
<p>Description - This management area contains a variety of wildlife habitat ranging from important big game summer range to big game winter range. It has a variety of physical environments including riparian, calving or fawning areas, and hiding cover. All slopes, aspects and elevations are represented as well as a wide variety of vegetation ranging from grasslands to densely timbered areas.</p>	
<p>Recreation – Controls over motorized recreation will be implemented where necessary to protect wildlife habitat values of this area.</p> <p>Nonmotorized dispersed recreation may be supported by constructing trails and trailhead facilities when compatible with management area goals.</p>	<p>Not applicable to the Tenmile - South Helena Project because there are no proposals that would change the travel management status of routes, constructs, or maintains trails. Control measures on motorized recreation would be implemented as a result of decommissioning of unauthorized roads in the project area. This standard is met.</p>
<p>Visual – Management practices will generally follow guidelines for the partial retention VQO. Exceptions may occur on a case-by-case basis to meet wildlife objectives. The portions of this area (if any) that are within the sensitive viewing areas of the roads, trails, and areas listed in Appendix B will be managed to meet the VQOs noted in the appendix. [See Forest Landscape Management Book, Vol. 2 (Ag. Hdbk. No. 462) for definitions of VQOs and how they are applied.]</p>	<p>Implementation of both action alternatives would be consistent with this management area. By implementing the design criteria described above, VQOs for partial retention would be met.</p> <p>Proposed landings, temporary roads, skyline corridors, and, skid trails in areas with VQO's of retention and partial retention would meet VQO standards but not immediately upon implementation of activities. However, design criteria would minimize any short-term negative impacts and will result in long-term positive effects to the scenic quality of the project area.</p>

Management Standards	If Standard applies, how is standard being met
<p>Wildlife and Fisheries – Wildlife habitat improvement practices, including road management, prescribed fire, and other techniques, will be used to maintain and/or enhance the quality of big game and nongame habitat. Maintain adequate thermal and hiding cover adjacent to forage areas. Generally this means providing at least 25 percent cover, where available, on identified winter range.</p>	<p>(1) <i>Wildlife habitat improvement practices, including road management, prescribed fire, and other techniques, will be used to maintain and/or enhance the quality of big game and nongame habitat.</i> Roads to be used for the project activities would be managed to minimize effects to elk during project implementation. Prescribed fire goals include improving grass and shrublands which would be beneficial to elk. Both action alternatives are consistent with this recommendation.</p> <p>(2) <i>Maintain adequate thermal and hiding cover adjacent to forage areas; this generally means providing at least 25% [thermal] cover, where available, on identified winter range.</i> There are 1,412 acres of W-1 in the project area of which 1,296 are considered winter range. Of that, 311 acres are considered Forest Plan thermal cover which is 24%, less than Forest Plan thresholds. The two action alternatives would treat thermal cover on 52 acres in winter range in both Alternatives 2 and 3. However, Alternative 3 includes more low severity prescribed fire acres than Alternative 2. Remaining Forest Plan thermal cover in W-1 is 263 acres in Alternative 2 and 292 in Alternative 3. Even though both action alternatives treat 52 acres of thermal cover, the difference in the remaining acres is due to the greater amount of low severity prescribed fire in Alternative 3, which has been assumed to not reduce thermal cover. Remaining percentages of thermal cover are 20% and 23% for Alternatives 2 and 3, respectively. A site-specific amendment would be needed to implement either action alternative.</p>
<p>Range – Livestock grazing generally does not occur in this management area, except for minor amounts within existing allotments. Livestock grazing will continue within active allotments, however, the level may be increased or decreased if monitoring or range analysis show a need or opportunity to change.</p>	<p>Not applicable because the Tenmile-South Helena Project does not propose any changes to livestock use within the project area.</p>
<p>Timber - Timber will be harvested only if it can be used as a tool to maintain or enhance wildlife habitat values. Productive forest land is classified as unsuitable for timber management</p>	<p>This standard applies and is met because there is no timber harvest proposed in this management area.</p>
<p>Water and Soils – See Forest-Wide Standards.</p>	<p>Standard is met, see Forest-Wide Standards above.</p>
<p>Minerals – Locatable – Timing of mineral activities will be coordinated where practical with the needs of wildlife. This generally will require negotiations during development of operating plans for no surface occupancy during critical wildlife use. Leasable ---- See Forest Plan Amendment #13 for lease standards</p>	<p>This standard does not apply to the Tenmile – South Helena project because the project does not propose any changes to mineral activities.</p>
<p>Lands – See Forest-Wide Standards.</p>	<p>See Forest-Wide Standard</p>

Management Standards	If Standard applies, how is standard being met
<p>Facilities – Roads will generally not be constructed for surface management activities within this area. Exceptions may occur if needed for wildlife improvement projects. Roads through this area, which provide access to adjacent areas, are permitted only if project planning indicates it is the most feasible access.</p> <p>Road construction should avoid important big game areas, such as wet, boggy areas.</p>	<p>New temporary road construction is proposed under the action alternatives, to access vegetation treatment units. New temporary roads would be closed and rehabilitated after use.</p>
<p>Protection - Areas will be evaluated periodically for significant insect and disease problems. Endemic levels will be accepted as normal. If epidemic levels develop and control is necessary, the control method should minimize impacts on big game and other wildlife values.</p> <p>The appropriate fire suppression response ranges from control to confinement in this management area depending upon location, expected fire behavior, and other decision criteria related to values at risk. These decision criteria are stated in the Fire Management Direction in Appendix R.</p> <p>Prescribed fire with planned ignitions will be used in this management area, for the enhancement and maintenance of resources.</p> <p>Prescribed fire with unplanned ignitions may be used in this management area, for the enhancement and maintenance of resources, when within pre-established prescribed fire criteria. These criteria are detailed in the Fire Management Direction in Appendix R.</p> <p>Prescribed fire may be used as a tool to reduce natural fuels and improve quantity and quality of wildlife forage.</p>	<p>Standard does not apply to No Action, but does apply to the Action Alternatives and is met. Proposed harvest would respond to insect-caused mortality and lower the hazard of future insect problems within treatment units. Prescribed fire would be used to reduce natural fuels. Refer to Forested Vegetation Specialist Report.</p> <p>Prescribed burning will be used in action alternatives to improve forage. Standards will be met through the development of silvicultural prescriptions and burn plan development. Additionally, adherence to design criteria will help meet standards relating to prescribed burning.</p>
<p>Riparian – See Forest-Wide Standards for grazing in riparian.</p>	<p>This standard is met. Riparian design criteria and BMPs would be followed.</p>
<p>Management Area W2 96 acres)</p>	
<p>Management Goals - Maintain and/or enhance habitat characteristics favored by elk and other big game species during spring, summer, and fall. Provide habitat diversity for non game wildlife species. Provide forage for both big game and livestock. Provide for other resource objectives as long as their uses are compatible with the wildlife and livestock objectives.</p>	
<p>Description – This management area consists of riparian and other lands that have forage, resting, and security characteristics and provide important spring, summer, and fall requirements for all big game species. Range allotments are in parts of the area. The variations in elevation, topography, slope, and aspect make these areas rich in species diversity.</p>	
<p>Recreation – Controls over motorized recreation will be implemented where necessary to protect wildlife habitat values of this area.</p> <p>-Nonmotorized dispersed recreation may be supported by constructing trails and trailhead facilities when compatible with management area goals.</p>	<p>Not applicable to the Tenmile - South Helena Project because there are no proposals that would change the travel management status of routes, constructs, or maintains trails. Control measures on motorized recreation would be implemented as a result of decommissioning of unauthorized roads in the project area. This standard is met.</p>

Management Standards	If Standard applies, how is standard being met
Visual – Management practices generally will follow guidelines for the partial retention VQO. Exceptions may occur on a case-by-case basis where necessary to meet the area goals. [See Forest Landscape Management Book, Vol. 2 (Ag. Hdbk. No. 462) for definitions of VQOs and how they are applied.]	<p>Implementation of both action alternatives would be consistent with this management area. By implementing the design criteria described above, VQOs for partial retention would be met.</p> <p>Proposed landings, temporary roads, skyline corridors, and, skid trails in areas with VQO's of retention and partial retention would meet VQO standards but not immediately upon implementation of activities. However, design criteria would minimize any short-term negative impacts and will result in long-term positive effects to the scenic quality of the project area.</p>
Wildlife and Fisheries – Most new roads and about 50% of existing roads will be closed, at least seasonally. -Wildlife habitat improvement practices, including road management, prescribed fire, and other techniques, will be used to maintain and/or enhance big game calving and summer habitat. -Maintain adequate thermal and hiding cover adjacent to forage areas.	<p>(1) <i>Most new roads and about 50% of existing roads will be closed, at least seasonally.</i> There are no existing or proposed roads in management area W-2. Therefore this is not applicable.</p> <p>(2) <i>Wildlife habitat improvement practices, including road management, prescribed fire, and other techniques, will be used to maintain and/or enhance big game calving and summer habitat.</i> The project is designed to avoid calving and nursery areas; elsewhere prescribed fire in summer habitat should improve forage conditions.</p> <p>(3) <i>Maintain adequate thermal and hiding cover adjacent to forage areas.</i> Twelve acres of thermal cover would be treated with low severity prescribed fire in Alternative 2. There are no treatments in thermal cover in Alternative 3. Since low severity prescribed fire is assumed to not reduce thermal cover, the status quo would be maintained under implementation of Alternative 2 and consistency with this standard is retained.</p>
Range – Livestock grazing will generally be maintained near the 1983 levels within existing allotments, unless monitoring or a range analysis indicates a need to change. -Livestock grazing will not be expanded into new areas. -Planning for livestock improvements, such as fencing and water developments, will be coordinated with the wildlife biologist.	<p>Not applicable because the Tenmile-South Helena Project does not propose any changes to livestock use within the project area.</p>
Timber - Forested land is classified as unsuitable for timber management. - Timber harvest will be used only to maintain or enhance habitat values.	<p>This standard applies and is met because there is no timber harvest proposed in this management area.</p>
Water and Soils – See Forest-Wide Standards.	<p>Standard is met, see Forest-Wide Standards above.</p>
Minerals – Locatable – To the extent feasible, timing of mineral activities will be coordinated with the needs of wildlife and water. This generally will require negotiation during development of operating plans from May 15 to June 30. - Leasable ---- See Forest Plan Amendment #13 for lease standards	<p>This standard does not apply to the Tenmile – South Helena project because the project does not propose any changes to mineral activities.</p>
Lands – See Forest-Wide Standards.	<p>See Forest-Wide Standards</p>

Management Standards	If Standard applies, how is standard being met
<p>Facilities –Road construction should not be necessary for surface management, however, roads can be built through the area to access other management areas or for minerals development.</p> <ul style="list-style-type: none"> -Road construction should avoid important big game areas, such as wet boggy areas. -Road management will be used to minimize disturbance to big game during critical periods. 	<p>This standard applies and is met. The Tenmile – South Helena project does not propose any road construction in this management area.</p> <p>Existing roads would be maintained or reconstructed in accordance with Montana and R1 BMPs under the action alternatives.</p>
<p>Protection - Areas will be evaluated periodically for significant insect and disease problems. Endemic levels will be accepted as normal. If epidemic levels develop and control is necessary, the control method should minimize impacts on the big game summer range values.</p> <ul style="list-style-type: none"> - The appropriate fire suppression response ranges from control to confinement in this management area depending upon location, expected fire behavior, and other decision criteria related to values at risk. These decision criteria are stated in the Fire Management Direction in Appendix R. - Prescribed fire with planned ignitions will be used in this management area, for the enhancement and maintenance of resources. - Prescribed fire with unplanned ignitions may be used in this management area, for the enhancement and maintenance of resources, when within pre-established prescribed fire criteria. These criteria are detailed in the Fire Management Direction in Appendix R. 	<p>Standard does not apply to No Action, but does apply to the Action Alternatives and is met. Proposed harvest would respond to insect-caused mortality and lower the hazard of future insect problems within treatment units. Prescribed fire would be used to reduce natural fuels. Refer to Forested Vegetation Specialist Report.</p> <p>Standards will be met through the development of silvicultural prescriptions and burn plan development. Additionally, adherence to design criteria will help meet standards relating to prescribed burning.</p>
<p>Riparian –See Forest-Wide Standards for grazing in riparian.</p>	<p>This standard is met. Riparian design criteria and BMPs would be followed.</p>

APPENDIX C: CUMULATIVE EFFECTS

The area to be analyzed in a cumulative effects analysis is not always limited to the project area, and it varies with the resource or species being analyzed. Each resource will have different “boundaries” for its effects analysis. Quantified, detailed information regarding effects, leading to specific reasoned conclusions can be found in the cumulative effects section of each specialist report located in the project record. The following tables of past, present, and reasonably foreseeable projects have been used by the interdisciplinary team members in determining the cumulative effects for their respective resource. Each resource specialist has determined which of the following activities are applicable to their analysis, depending on their cumulative effects boundary. Some resource reports may mention a project that is missing from this table, however the “hard look” for analysis purposes has been taken.

Table 252 displays the Past Vegetative and Fuels Activities which have influenced the existing condition. The areas considered include the Tennile – South Helena project area and the larger Tennile – South Helena Combo Boundary. Vegetative and fuels activities are sorted by decade. Harvest and fuels records prior to 1950 are generally not available. Harvest activities are sorted by intermediate and regeneration treatments. “Fuels Activities” includes stand-alone activities such as prescribed fire, hand slashing (Site Preparation/Thinning, Rearrangement of Fuels – Lop & Scatter), pile burning, mastication/chipping and wildfire with fuels benefits. **Timber harvest and/or prescribed fire acres often overlap on the same piece of ground; the acres reported here reflect additively such multiple entries.** For example, one 30-acre stand may have a harvest treatment followed by an under burn; this sequence would be reported as 60 acres of activities. However, the actual “footprint” of activities is actually smaller. GIS databases provide clarification on the actual footprint of activities.

Table 254 reflects present and ongoing projects and activities. These projects are in the implementation phase.

Table 255 displays the Reasonably Foreseeable projects. These projects are still in the planning phase, which means there is potential for change due to public input, changed conditions, etc.

Past, present, and future activities on this list are displayed as being located either in the project area, combo boundary, or crossing over both boundaries. Because the project boundary is totally encompassed by the combo boundary, any activity shown as being only in the project boundary would also count as an activity within the larger combo boundary. The activities that are checked as being within both the project and combo boundary are activities that crossed or occurred within both boundaries.

Table 255. Past vegetative and fuels activities/projects

Activity/Name	Decade/Year	Scope of Activity	
Pre 1960			
Forest Service Timber Harvest	Pre 1960	Tenmile South Helena Project Area Regen Harvest: 0 acres Intermediate Harvest: <u>0 acres</u> Total: 0 acres	Tenmile South Helena Combo Boundary Regen Harvest: 17 acres Intermediate Harvest: <u>0 acres</u> Total: 17 acres
Fuels Activities	Pre 1960	Tenmile South Helena Project Area Total Fuels acres: 0 acres	Tenmile South Helena Combo Boundary Total Fuels acres: 34 acres
1960 - 1969			
Forest Service Timber Harvest	1960 - 1969	Tenmile South Helena Project Area Regen Harvest: 45 acres Intermediate Harvest: <u>3 acres</u> Total: 48 acres	Tenmile South Helena Combo Boundary Regen Harvest: 673 acres Intermediate Harvest: <u>4 acres</u> Total: 724 acres
Fuels Activities	1960 - 1969	Tenmile South Helena Project Area Total Fuels acres: 32 acres	Tenmile South Helena Combo Boundary Total Fuels acres: 574 acres
1970 - 1979			
Forest Service Timber Harvest	1970 - 1979	Tenmile South Helena Project Area Regen Harvest: 444 acres Intermediate Harvest: <u>0 acres</u> Total: 444 acres	Tenmile South Helena Combo Boundary Regen Harvest: 1,835 acres Intermediate Harvest: <u>53 acres</u> Total: 1,888 acres
Fuels Activities	1970 - 1979	Tenmile South Helena Project Area Total Fuels acres: 428 acres	Tenmile South Helena Combo Boundary Total Fuels acres: 1055 acres
1980 - 1989			
Forest Service Timber Harvest	1980 - 1989	Tenmile South Helena Project Area Regen Harvest: 299 acres Intermediate Harvest: <u>0 acres</u> Total: 299 acres	Tenmile South Helena Combo Boundary Regen Harvest: 1,725 acres Intermediate Harvest: <u>4 acres</u> Total: 1,728 acres
Fuels Activities	1980 - 1989	Tenmile South Helena Project Area Total Fuels acres: 85 acres	Tenmile South Helena Combo Boundary Total Fuels acres: 808 acres

Activity/Name	Decade/Year	Scope of Activity	
1990 - 1999			
Forest Service Timber Harvest	1990 - 1999	Tenmile South Helena Project Area Regen Harvest: 36 acres Intermediate Harvest: <u>104 acres</u> Total: 168 acres	Tenmile South Helena Combo Boundary Regen Harvest: 718 acres Intermediate Harvest: <u>149 acres</u> Total: 867 acres
Fuels Activities	1990 – 1999	Tenmile South Helena Project Area Total Fuels acres: 238 acres	Tenmile South Helena Combo Boundary Total Fuels acres: 1,692 acres
2000 - 2009			
Forest Service Timber Harvest	2000 - 2009	Tenmile South Helena Project Area Regen Harvest: 8 acres Intermediate Harvest: <u>18 acres</u> Total: 26 acres	Tenmile South Helena Combo Boundary Regen Harvest: 8 acres Intermediate Harvest: <u>33 acres</u> Total: 41 acres
Fuels Activities	2000 - 2009	Tenmile South Helena Project Area Total Fuels acres: 1,878 acres	Tenmile South Helena Combo Boundary Total Fuels acres: 2,809 acres
2010 - 2014			
Forest Service Timber Harvest	2010 - 2015	Tenmile South Helena Project Area Regen Harvest: 629 acres Intermediate Harvest: <u>513 acres</u> Total: 1,142 acres	Tenmile South Helena Combo Boundary Regen Harvest: 715 acres Intermediate Harvest: <u>1,156 acres</u> Total: 1,871 acres
Fuels Activities	2010 - 2015	Tenmile South Helena Project Area Total Fuels acres: 2,247 acres	Tenmile South Helena Combo Boundary Total Fuels acres: 2,477 acres
Timber Harvest on Private and other non FS ownership (acres are approximated based on GIS)	2005 - 2015	Tenmile South Helena Project Area Timber Harvest: <u>74 acres</u> Total: 74 acres	Tenmile South Helena Combo Boundary Timber Harvest: <u>1,948 acres</u> Total: 1,948 acres

Table 256. Table C1A – additional past activities/projects (excluding harvest/fuels)

Project/Activity Name	Decision Date and/or Status	Location		Brief Description
		Project Area	Combo Boundary	
Banner Creek Bridge #1	2014	X		Deck and curb replacement.
EPA-Landmark Subdivision	2014	X		Remediation of the Landmark Subdivision. Final property remediation was to be completed in 2014.
Albright Special Use Authorization	2014	X		This project is the issuance of a new special use authorization to replace existing authorization HEL116, which expires at the end of 2013. The special use authorization is for a domestic well and associated infrastructure.
EPA-Little Lilly/Lee Mountain Complex removal and reclamation	2013	X		Mine waste removal and reclamation. Also installed groundwater monitoring wells to evaluate arsenic levels pre and post removal.
Sally Anne Road	2011	X	X	Aquatic Organism Passage Legacy Road: Road 527 replace undersized Sally Anne culvert with a 12' span by 4' rise by 40' long three sided concrete box culvert.
Wakina Sky Trail Relocation	2011	X		Relocated appx. 1/2 mile of trail from private land to HNF. Old trail made impassable by using dead and down trees and rocks.
Sally Ann Cr. Culvert Replacement	2010	X	X	Minnehaha Road 527, MP 0.8, remove existing culvert and install one AOP recast 3-sided concrete box culvert 12 foot span X 4 foot rise X 40 feet long; 4 inches new surface aggregate for 240 feet.
Minnehaha Road	2010	X		Legacy Road: Road 527 recondition 4.9 miles, construct 3 drain dips; 4" new surface aggregate on 1.15 miles; install 36 new 18" culverts; replace 2 undersized culverts w/ larger culvert.
MT Army National Guard	2010	X	X	Permit for winter survival training on MacDonald Pass.
Hahn Creek Roads	2010		X	American Restoration & Recovery Act: Road 495 replace undersized Hahn Creek culvert w/ a 123" span by 83" rise by 40' corrugate steel pipe arch. Road 1856 replace undersized culvert w/ a 123" span by 83" rise by 40' corrugate steel pipe arch.

Project/Activity Name	Decision Date	Location		Brief Description
National Guard High Elevation Helicopter Landing Training	2010	X	X	MT National Guard requested to conduct helicopter pilot training at various peaks on the Helena National Forest as well as water bucket training. Red Mtn., Treasure Mtn., Negro Mtn., Hog Back, and Lava Mtn.
Telegraph Creek Roads	2009-2010		X	American Restoration & Recovery Act: Road 495 reconstruct 4.1 miles; 4" new surface aggregate for 4.1 miles; dust palliative 1.4 miles; install 24 new 18" culverts; replace 5 undersized culverts w/ larger culverts. Road 1856 install 7 new culverts; replace 4 undersized culverts w/ larger culverts. Road 1857 install 7 new culverts.
Clancy Grazing Allotment	2009		X	Signed EA reauthorizing grazing using an adaptive management strategy.
Macdonald Pass Wildfire	2009	X		Wildfire that burned approximately 170 acres in 2009.
Road Drainage Repairs	Completed 2009	X	X	Roads 123, 227, 495, 495-D1, 495-E1, 527, 1856, 1856-D1, 1856-E1, 1856-J1, 1857, 1857-D1, 1863, 1863-A1 and 4104; Blading 43.2 miles, construct drain dips 231.
U.S. Hwy 12 Improvements	October 2009		X	Removal of vegetation (4 to 5 log truck loads), installation of guard rails, erosion protection, and sanding/salting.
Continental Divide Trailhead (CDNST)	July 2009		X	Construction of approximately seven miles of new CDNST to reroute the trail to the Continental Divide. This new segment connects to the Bison Creek Area where the CDNST trail leads onto the neighboring Beaverhead-Deerlodge National Forest.

Project/Activity Name	Decision Date	Location		Brief Description
Chessman Road Reconditioning	2008	X	X	Chessman Rd. 299 recondition 4.4 miles; spot surface road with 600CY pit run aggregate.
Park Lake and Chessman Roads	2008	X	X	Park Lake Rd. 4009 recondition 6.2 miles; 4 inches new surface aggregate for 3.7 miles; install one 18 inch and one 30 inch culvert. Chessman Rd. 299 recondition 0.9 miles; construct 4 drain dips.
Zucconi Private Road	November 2008		X	Road construction of about 2,000 feet
Blackhall Meadows Stream Gully Restoration	2007	X		Stabilize an eroding gully by reshaping steep cut-banks to a gradual angle, installing logs, rocks, and/or erosion control fabric to alleviate head cutting. Also, re-vegetate bare soil with native plants and fence site to exclude cattle.
Spring Hill Land Exchange	2007	X		Exchange of private lands for NFS lands to consolidate land ownership and to improve administration of those lands. T 9 N, R 4 W.
Tri-Arabian Horse Club Judged Trail Ride	June 2007		X	This special recreation use permit authorized the Club to use existing trails and routes located west of Helena, Montana in the Sweeney Creek area. This non-motorized event authorized up to 75 participants and spectators and occurred from September 9 and 10, 2007.
Clancy Unionville AMP	2006	X	X	Allotment management plan for the Clancy Unionville area.
Continental Divide Trailhead & Connector Trail	August 2005	X	X	Construction of trailhead and approximately ½ mile of new road to access the trailhead and approximately ½ mile of connector trail to tie in with the existing Continental Divide National Scenic Trail
Special Use Permit to the U.S. Army/Montana National Guard Sweeney Creek land Navigation Course	September 2004		X	This special use permit authorized the National Guard to use the Sweeney Creek area for land navigation exercises in the spring and fall. Monitoring of wildlife for potential effects was required due to winter range concerns.

Project/Activity Name	Decision Date	Location		Brief Description
North Western Corporation Moose Creek Utility Extension	February 2004	X		This decision authorized the North Western Corp. the installation, use & maintenance of a 0.6kV buried power line in the Moose Crk drainage. This action includes a 30-foot power line & power pole.
Bridge and Guardrail Upgrade	2003	X	X	Moose Creek Campground Rd. 4180, MP .1, upgrade bridge curbs; Minnehaha Rd. 527, MP 7.9, upgrade bridge guardrails; Banner Cr. Rd. 1876, MP 0.3, Bridge #1, upgrade guardrails, MP 0.8, upgrade curbs; Telegraph Rd 495, MP 0.9, upgrade bridge curbs; Ontario Cr. Rd 123, MP 0.1, Bridge #1, upgrade curb, MP 0.3, Bridge #2, upgrade curbs.
Jericho Mountain Continental Divide Trail Reroute	April 2003	X	X	This decision implemented new trail construction of approximately 2.2 miles of the CDNST #337 to align the trail to the Continental Divide as per Agency guidance.
Eakin Encroachment	August 2002	X		Continued use of a small tract on NFS lands currently occupied by an encroaching privately owned garage. A special use permit for occupancy of .04 acres was issued to Kirk and Cathy Eakin.
Touch America, Inc. Fiber Optic Installation	September 2000		X	Authorization to install, use and maintain six underground two-inch fiber optic ducts, one duct installed w/ a fiber optic cable, on NFS lands near Hwy 12 on MacDonald Pass using a Construction Special Use Permit followed by a single, consolidated, region wide Special Use Permit. About 1.15 acres within the paved/gravel shoulder of Hwy 12.
Browns Gulch C&H Allotment	2000		X	1 acre within combo boundary. This allotment has been vacant since 2000. Located in Elkhorn Mountains.
Telegraph Cr. Rd. 495 Surfacing and Drainage	2000		X	Road 495 recondition 8.4 miles; 12 inches grid rolled aggregate for 2.25 miles; 4 inches surface aggregate for .48 miles; construct 9 drain dips.
Continental Divide Trail Reconstruction Phase 1	April 1999	X	X	Phase I entailed the construction/reconstruction on several non-motorized segments of CDNST #337 near MacDonald Pass, Mullan Pass to Priest Pass, and Black Mountain.
EA Continental Divide Scenic Trail on Federal Lands	April 1999	X	X	An environmental assessment was used for analysis.

Project/Activity Name	Decision Date	Location		Brief Description
Monarch Creek Trail Reconstruction	June 1998		X	Construction/reconstruction of the non-motorized Monarch Creek Trail #362 in the Electric Peak Roadless Area. Work includes installation of 65 water-bars, 3 wooden stock bridges, and 3 French Drains; reconstruction of 5 switchbacks; construction of a turnpike approximately 25 meters long, obliterate approximately 727 meters of abandoned trail and grub approximately 560 meters of existing trail.
Frontier Town Monument, Sign, and Power Line	February 1998		X	Re-issuance of a Special Use Permit to Erik Little, the new owner of Frontier Town for the private-owned monument, sign, and power line on 0.22 acres of NFS lands.
Recreational special use permit	1998-2002		X	These permits are issued for short term use on public lands for recreational activities/gatherings. MT DOC (1998), Elliston VFD (1998), CTVA (2002)
Treasure Mountain Snowmobile Trail Relocation	November 1997	X	X	This decision approved relocating segments of the groomed snowmobile trail in the Treasure Mountain area. Segments included Little Blackfoot River Road, FSR 1857-A1, FSR 1857, FSR 1857-D1, FSR 1859 to the Telegraph Creek Road. Another section starts on FSR 1857 at the junction with FSR 1857-B1 and proceeds on FRS 157-B1 to Ontario Creek Road 123.
Cellular Telephone Authorization; MacDonald Pass Electronics Site	October 1994		X	Authorized the use of NFS lands to install, operate and maintain a commercial cellular telephone facility on the MacDonald Pass Electronics Site.
Amateur Radio Authorization; MacDonald Pass Electronics Site	October 1994		X	Authorized the use of NFS lands to install, operate, and maintain an amateur radio system to co-locate within the U.S. Government facility at the MacDonald Pass Electronics Site.
Commercial road use permits	1994-2000	X	X	These permits were issued for short term commercial use of Forest Service Roads. D&G Lumber (2000), Minnehaha Creek (1997), Red Mountain/Park (1995), Buillion Parks/Telegraph Creek (1994), Stowe (1994)

Project/Activity Name	Decision Date	Location		Brief Description
Minnehaha Trail Project	September 1991	X		Decision authorized the development of a trail route between the Moose Creek work center and Forest Road 527 using an old abandoned railroad bed. Activities included construction of a bridge, installing a culvert, pruned trees and shrubs, removed rocks, and relocated power poles off the railroad bed.
Ten-Mile Creek Gravel Source Drilling	July 1991	X		Authorized construction of approximately 580 feet of private road across NFS lands for short-term access to a gravel source. Up to 5 core sample test holes were implemented with the road obliterate and re-vegetated after completion of the sampling.
John T. and Merrylee McCrea small Tracts Case	July 1991	X		The Forest Service sold 2.8 acres that contained three tracts of mineral fractions virtually surrounded by patented mining claims to John T and Marylee McCrea in order to improve management and adjust property boundaries.
U.S. West Buried Phone Line	June 1991	X		This decision authorized installation of a buried phone line across NFS lands within the ROW of FSR #137 under a special-use permit.
MacDonald Pass Cattle and Horse Allotment	November 1990	X	X	This was an approved updated allotment management plan for the MacDonald Pass C&H allotment. This involved the implementation of a three pasture deferred rotation system and construction of approximately 0.5 miles of barbed wire fence.
Issuance for Mining Plan of Operations	1989-1992	X	X	Pegasus Drill Project and Mining Plans of Operation for Clemmer Gulch & O'Keefe Mountain (1992): 2 acres surface disturbance for 60x60 foot drill pads and temporary road construction; Phelps Dodge Karger II (1990): exploratory drilling with reclamation work; Phelps Dodge Mining Co. (1989):): exploratory drilling and trenching temporary drill pads and temp roads built with reclamation work

Project/Activity Name	Decision Date	Location		Brief Description
Clancy Cattle & Horse Allotment Revision	July 1988		X	Decision approved implementation of a modified rest rotation grazing system for the Clancy allotment. This was agreed to with the grazing permittee at that time with some stipulations. Some changes included moving two cattleguards, installing three new cattleguards, relocating or installing seven miles of fence, reconstructing two miles of boundary fence & removal of one mile of fence.
Chessman Reservoir Complex-Repair and Management	February 1988	X		Issued the City of Helena a permit authorizing the Chessman Reservoir and dam rehabilitation work subject to mitigation along with associated facilities.
Treasure Mountain Timber Sale	August 1987		X	About 519 acres of clearcut timber harvest and 57 acres of basal area reduction. About 6.2 mmbf would be removed between watersheds around Telegraph Creek. This decision included 6.7 miles of new roads, 7.8 miles of re-construction.
Chessman Minerals Pit Site	July 1987	X		Determined that this pit site is ideal to be used for repair and maintenance of existing forest roads.

Table 257. Present and ongoing activities

Project/Activity Name	Decision Date and/or Status	Location		Brief Description
		Project Boundary	Combo Boundary	
Red Mountain Flume/Chessman Reservoir Project	2014-ongoing	X	X	Currently implementing fuel reduction project around Chessman Reservoir and the associated water flume infrastructure. Treatments are designed to reduce hazardous fuels around existing infrastructure. Approximately 500 total acres of fuels treatments and harvest are expected.
11 Recreation Residence Tracts	Ongoing	X	X	Residences are authorized under a 20-year Special Use Permit. Lots are typically 1 acre or less in size. These cannot be utilized as a primary residence and can only be used less than six months in a calendar year. Five recreation residences are permitted within the Moose Creek VillaTract that falls within the project boundary. Six recreation residences are permitted within Forest Heights and fall within the combo boundary.
3 Campgrounds 1 Day Use Areas 1 Rental Cabin 8 Trailheads	Ongoing	X	X	<p>Campgrounds are open seasonally from May through October and include: Moose Creek, Cromwell Dixon and Park Lake.</p> <p>Day use areas: Tenmile Picnic Site.</p> <p>Rental Cabin: Moose Creek</p> <p>Trailheads in project boundary: MacPass CDNST, Park City, Helena Ridge Trail, Lazyman, Moose Creek, and Lava Mtn., Trailheads in Combo boundary: Monarch and Joe Bowers</p>

Project/Activity Name	Decision Date	Location		Brief Description
Routine Use and Maintenance of Non-motorized Forest Trails for Summer Use	Ongoing	X	X	<p>There are some non-motorized trails in the Tenmile Drainage including the Switchback Ridge Trail.</p> <p>Other areas: Continental Divide National Scenic Trail and Monarch.</p> <p>These trails receive routine maintenance and clearing of debris annually.</p>
Routine Use and Maintenance of Forest trails and areas for over-snow winter use	Ongoing	X	X	<p>The formerly Quigley Group Use Area/Campground is sometimes used by cross-country skiers</p> <p>The former Moose Creek Group Use Area is utilized as a snowmobile trailhead accessing a trail system that connects to Bullion Parks over to Jericho Mountain and down along the Hahn Creek Road tying into the Little Blackfoot Road and Kading Cabin /Limburger Springs areas. There is also a snowmobile trailhead located off of the Little Blackfoot Road near the Lions Sunshine Camp.</p> <p>Please refer to the Divide Travel Plan alternative maps for specific trail locations and areas open to over-snow use.</p>
MacDonald Vista Point	Ongoing	X	X	<p>This vista point is located to the south of MacDonald Pass and is a popular observation site.</p> <p>It accesses the Continental Divide National Scenic Trail.</p> <p>During the winter months, this area has been utilized for non-motorized environmental education programs.</p>
Electronic Sites south of Hwy 12 on MacDonald Pass	Ongoing	X	X	<p>The south site retains 1 authorized airport beacon near the Vista Point overlook.</p>

Project/Activity Name	Decision Date	Location		Brief Description
Special use permits for trail runs and rides	Ongoing	X	X	5 special use permits are issued to various groups for 3 trail runs and 2 mountain bike rides.
HMO Closures on the Helena Ranger District	Ongoing	X	X	Access controls or the permanent closure of mine openings on the Helena Ranger District to ensure public safety. Closures will take place at multiple locations across the Helena Ranger District. More expected closures in 2015 and beyond.
Power Utilities, Phone Utilities, Yellowstone Gas Pipeline, & Touch America Fiber Optic Lines	Ongoing	X	X	Utility lines are authorized under the terms of a special use permit. The gas and fiber optic line are co-located. Routine maintenance are accepted and understood under the terms of the permit. 41 permits are located within the project and combo boundaries.
39 Private Road Special Use Permits issued to private landowners	Ongoing	X	X	These permits were issued to private landowners to access their private land on roads that are primarily not open to public use and some have seasonal closures. 27 permits are located within the project boundary only while the other 12 fall within the combo boundary.
DOT Right of Way	Ongoing	X	X	7 Department of Transportation easements are located in the project and combo boundaries.
Prickly Pear Sportsman's Association Shooting Range	Ongoing		X	The Prickly Pear Sportsman's Association recreational shooting range operates under a special use permit on the North side of Highway 12 on MacDonald Pass.
Livestock and Cultivation Special Use permits	Ongoing		X	4 livestock area and 2 cultivation permits are issued in the Elkhorn Mountains which reside in the combo boundary.
Fence/Ag residence permits	Ongoing		X	1 permit for a fence and 1 permit for agricultural residence are located in the combo boundary.
Encroachment permit	Ongoing	X		Special use permit issued for structure encroachment onto FS lands. Located in project area.
Highway Maintenance Station under a special use permit	Ongoing		X	This is under a special use permit issued to the Montana State Department Commission. The station is located on the upper east side of MacDonald Pass on the west side of US Highway 12.
Water transmission permits	Ongoing	X		7 special use permits issued for multiple water transmission activities. Issued to both private residents and City of Helena. All are located in project boundary.

Project/Activity Name	Decision Date	Location		Brief Description
5 Natural Resource Conservation Service Snotel Sites under a special use permit	Ongoing	X	X	The NRCS maintains 5 sites for monitoring snow depth and water content under a special use permit. 4 sites are located in the project area while 1 site is located in the combo boundary.
Timber Harvest on Private or other non FS lands.	Ongoing	X	X	Timber harvest may occur on private lands on unspecified acres, primarily tractor logging within the planning area
Noxious Weed Treatment on National Forest Lands	Ongoing	X	X	Herbicide treatment is primarily along roads and in patches that are accessible to mechanized equipment (spraying with ATVs) and/or by hand, biological (insects), goats/sheep, and aerial spraying. Treatment areas are identified in the EIS/ROD and are continually updated and treated as new infestations are located.
Grazing Activities on Private Lands	Ongoing	X	X	Grazing of cattle, sheep and horses on private lands within the Tenmile South Helena Project and Combo boundary. This may result in impacts to riparian vegetation, stream banks, and upland vegetation. There will also be results to vegetation management, forage production, and economic well-being.
MacDonald Pass C&H Grazing Allotment	Ongoing	X	X	4,573 acres within the combo boundary, 2,518 acres within the project boundary. 104 cow/calf pair; 115 permitted use days; start of permit in late June; resides on both sides of the divide and is under a deferred grazing system.
Frohner C&H Grazing Allotment	Ongoing	X	X	1,096 acres in the project area, 5,739 acres within the combo boundary; 100 permitted cow/calf pair; 92 permitted use days; start of permit in July 1; deferred grazing system. Allotment has seen little use in last 3 years because of blowdown trees destroying fences. Data collected 2009.
Big Buffalo C&H Grazing Allotment	Ongoing	X	X	7,638 acres within project boundary, 7,642 acres within the combo boundary; 100 permitted cow/calf pair; 92 permitted use days; start of permit July 1. Data collected 2009
Little Buffalo C&H Grazing Allotment	Ongoing	X	X	4,260 acres within project boundary, 4,261 acres within combo boundary. 100 permitted cow/calf pair; 92 permitted use days; start of permit July 1. Rested in 2013. (Little Buffalo is in a rest year for 2014)

Project/Activity Name	Decision Date	Location		Brief Description
Austin C&H Grazing Allotment	Ongoing		X	1,720 acres within combo boundary; 24 permitted cow/calf pairs on FS. 30 permitted use days from 6/1-6/30.
Clancy C&H Grazing Allotment	Ongoing		X	4,289 acres within combo boundary; 100 permitted cow/calf pairs. 99 permitted use days from 6/24-9/30.
Quartz Rowe C&H Grazing Allotment	Ongoing		X	3,880 acres within combo boundary; 29 permitted cow/calf pairs. 168 permitted use days from 6/1-11/15.
Maupin C&H Grazing Allotment	Ongoing		X	2,766 acres within combo boundary; 65 permitted cow/calf pairs; 116 permitted use days from 6/15-10/15. Allotment is located in the northwest corner of the Elkhorn Mountains.
Tenmile Priest Pass C&H Grazing Allotment	Ongoing	X	X	<p>6,366 acres within project area, 12,336 acres within the combo boundary; 200 permitted cow/calf pair; 107 permitted use days; start of permit mid June; rest rotation; resides on both sides of the divide.</p> <p>2003 Contract for the Priest Pass and Black Mountain allotments, range conditions and weed inventories were completed under a contract.</p> <p>In 2009 proper functioning condition was reached on Mike Renig.</p> <p>A 10-year grazing permit was issued to the RV Ranch Ranch for the grazing of domestic livestock on the Hat Creek C&H Allotment in Powell and Lewis & Clark Counties, Montana on the Helena Ranger District.</p>
Basin/Boulder Chief/Cataract C&H Grazing Allotment	Ongoing		X	2,931 acres within combo boundary. Located on the Beaverhead-Deerlodge NF. 487 permitted cow/calf pairs, 61 permitted use days from 7/16-9/15. In 2014-328 permitted cow/calf pairs grazed 92 days from 7/1-9/30.

Project/Activity Name	Decision Date	Location		Brief Description
10-Mile EPA Reclamation	2010 - Ongoing	X		Reclamation/removal of approximately 40 to 50,000 cubic yards of soil from a road, residence, and the old Basin Creek Mine at the town of Rimini. Reclaimed sites will be re-vegetated. This project is on-going.
Monarch Mineral Sampling	Ongoing		X	Notice of Intent for mineral sampling and exploration activities to collect samples for testing from unprocessed mine material piles. Located in T8N, R6W, section 31.
Silver Crescent Mine	Dormant		X	Banner Creek Drainage. T8N, R5W, Sections 21, 22, 28. Currently dormant activity. Forest Service is holding bond.
Helena Mineral Society-Crystal Mine	Ongoing		X	Sally Ann Creek. T8N, R6W, Section 2
Clancy Unionville Vegetation Manipulation and Travel Management Project	Ongoing	X	X	Travel management, Forest vegetation improvements, Fuel treatments (non-activity fuels), Watershed improvements, Road improvements/construction, Road maintenance, Road decommissioning. Harvest activities have been completed, fuels treatments are ongoing.
Chessman Reservoir Complex & Waterlines/Ditches	Ongoing	X		The City of Helena was issued a special use permit to maintain the Chessman Reservoir and associated waterlines/ditches for providing potable water to the City of Helena. This reservoir and water system is located in the Red Mountain Area.
University of Montana-Helena Outfitter/Guide Permit	Ongoing	X	X	Permit issued for a variety of guided recreational activities in numerous locations on the Helena ranger district.

Project/Activity Name	Decision Date	Location		Brief Description
Travis Creek Power Line Relocation	Ongoing	X		Replacement of the 7.3kv overhead power line to a 7.2kv underground power line.
MT Army Nat. Guard High Elevation Helicopter Landing/Take Offs & Water Bucket Training	Ongoing	X	X	This decision issues a special use permit to the MT Army Nat. Guard to utilize Red & Lava Mountain for these landing & take off maneuvers during the months of June & December.
BLM – Clancy area Hazardous Fuels Reduction Project	Ongoing		X	BLM project is designed to reduce hazardous fuels on BLM administered lands within the WUI. Project activities will occur on up to 3,300 acres of the ~11,000 acre project area.
Public Firewood Gathering	Ongoing	X	X	Personal firewood permits are issued for NFS lands. Dead trees may be cut which occurs mainly adjacent to roadways.
Northwestern Energy Powerline	Ongoing-2015	X		Hazard tree removal along powerline corridor in Tenmile drainage and MacDonald pass.
EPA- Luttrell Repository	Ongoing	X		2014 & 2015: A two year work plan is being implemented so that the cost of opening Luttrell Repository and treatment of waste water resultant from opening the repository can be saved and used to further remedial actions: this approach requires consolidation of mine waste into stockpiles to be hauled to Luttrell Repository in 2015. In 2014, EPA conducted clearing & grubbing so as to establish transport roads for Off Road Waste Hauling Vehicles at the National Extension mine waste site (most accessible from the Basin Side and near the ridge) and the Bunker Hill mine group (located South of Rimini).

Table 258. Reasonably foreseeable activities

Project/Activity Name	Decision Date and/or Status	Location		Brief Description
		Project Boundary	Combo Boundary	
Golden Anchor Road	Foreseeable	X	X	Aquatic Organism Passage Legacy Road: Road 4100 construct a 60' span spill thru bridge over the existing ford on the Little Blackfoot River.
North Divide Travel Planning	Estimated Implementation 2014	X	X	The HNF is proposing changes to the existing roads and trail systems on National Forest System lands in the North Divide planning area. This plan will provide for a variety of motorized and non-motorized winter recreation opportunities.
Tenmile Road Improvement Project (County Route 695) also known as Rimini Road.	Foreseeable		X	Improve road way from the junction with Hwy 12 to the junction with the Chessman Reservoir intersection, just over 6 miles in length. Improvements would include replacement of three bridges and associated railings, bridge drainage improvements, upgrading road signs, re-alignment of road segments, and paving.
East Deerlodge Valley Landscape Restoration Management	Foreseeable		X	Beaverhead-Deerlodge NF. Purpose is to achieve Forest Plan Goals including Timber management, Aquatic Improvement, Wildlife Habitat improvement. Proposed activities include timber salvage, commercial thinning, sediment reduction, fish passage, road and trail decommissioning. Project includes 2,038 acres of commercial harvest, 340 acres of commercial thinning and commercial harvest, and 162 acres of commercial thinning.
Rimini Substation	Foreseeable	X		Baxendale Fire Dept.is proposing to pour a concrete slab and construct a 3 bay fire station to store firefighting equipment and to utilize existing underground tanks for the filling of fire engines during suppression activities.
Mineral Plan of Operations	Foreseeable	X	X	It is reasonably foreseeable that the Divide Travel Plan area will see continued interest in mineral activity, which will precipitate the submission of Plan of Operations proposals to the HNF, likely at similar activity scales and rates experienced presently.

Project/Activity Name	Decision Date	Location		Brief Description
Telegraph Creek MPB Salvage and Precommercial Thinning	Foreseeable		X	Approximately 6,335 acres are proposed for treatment. About 1,867 acres would be pre-commercially thinned (15-40year old stands). The remaining acres are mature stands with high MPB mortality, which would be treated with chainsaws, prescribed fire, masticators, feller-bunchers, and cable logging equipment. Primary prescription would be regeneration harvest. About 7 miles of new roads and 5 miles of reconstructed roads are needed. Post treatment may include about 3,800 acres of underburn, site prep, broadcast burn, jackpot burn, and hand pile burn.

APPENDIX D – WILDLIFE APPENDICES

Appendix A, Wildlife Analysis Approach

The following table describes how each wildlife parameter is addressed. Some of the parameters have been described in detail in the report, above, while others are either assumed to be unaffected by the Tennile – South Helena project or are assumed to be addressed under other parameters. Table A-1 provides the rationale for the level of analysis applied to each wildlife parameter.

Table 259. Wildlife analysis approach table.

Wildlife Parameter	Analysis Approach
Wildlife Habitats	
General	The project area comprises several types of wildlife habitats from wetland/riparian habitat to whitebark pine. The Wildlife Background Report analyzes in detail effects to wetland/riparian habitats, cool moist forested habitats, and dry forested habitats, all of which are most likely to be affected by the project. Other habitats are not analyzed in detail but described in the 'Topics not Analyzed in Detail' section. These are: aspen, whitebark pine, old growth forests, edges and ecotones, and grasslands.
Habitat Fragmentation	The Continental Divide region of the Helena NF is an inherently fragmented landscape of alternating grasslands and forest with riparian areas serving as focal habitats. These patterns are constantly shifting as a result of natural processes and human enterprises: natural succession, fire, insect outbreaks, climate shifts, timber harvest, livestock grazing, human settlement, water diversion and impoundment, road building. The extent of impacts associated with vegetation management depends on the species, its size, home range, and dispersal habits, as well as the juxtaposition of habitat. Species with small home ranges and limited mobility generally are more susceptible to the barriers and subsequent fragmentation associated with vegetation management. The Wildlife Background Report analyzes project effects to habitat fragmentation.
Continental Divide Linkage	The Divide has always been an inherently fragmented landscape of alternating grasslands, forests, and local riparian sites. Historically, however, habitats were sufficiently linked by direct connection or proximity that species specialized for one habitat or another (marten or goshawks, for example) were able to move across the landscape. Shifts in habitat patch size and connectivity were generated by fire, insect outbreaks, and other natural phenomena. Since the 1860's, mining, roads, and other long-term human-generated features on the landscape have created rigid movement barriers and impacted riparian areas. These features have reduced the size of habitat patches in which wildlife species are able to operate free from human interference and thus have impeded the ability of a number of species to move through the landscape. The Wildlife Background Report analyzes project effects to travel corridors and linkage zones.
Snags and Down Woody Debris	Until recently, large snags and logs have been relatively uncommon over much of the Divide landscape because of the relatively young/middle-aged forest structure (80-120 years old) produced by widespread logging and fires in the late 19th and early 20th centuries. Exceptions have been in pockets of advanced mature and old-growth forest unaffected by historic fire and logging, a few drainages subject to winter kill in the late 1980's (e.g. Jericho Mountain), and a couple relatively recent mid-sized fires (Beartrap, MacDonald Pass). Numbers of snags and logs have now increased dramatically across the project area as a result of the mountain pine beetle epidemic. Most mortality is occurring in mature lodgepole pine, but whitebark and limber pine are affected as well. The Wildlife Background Report addresses this topic.
Noxious Weeds	Noxious weeds impact wildlife by reducing habitat availability where noxious weeds successfully out-compete native vegetation. Weeds are discussed in the Wildlife Background Report only as they relate tangentially to other habitat components and processes (elk winter range, ATV off-trail use, livestock grazing, etc.).
Unique Features	Several wildlife species utilize unique features such as cliffs, caves, and talus slopes. These features are not analyzed as a separate topic in the Wildlife Background Report; rather, they are analyzed under the respective species that utilizes the unique feature where applicable.

Wildlife Parameter	Analysis Approach
Big Game	
Elk	<p>The elk is a key species on the Helena NF—as an object of public fascination and scrutiny and as a management indicator for other big game species that depend on the same diverse habitat spectrum. Elk make use of a variety of habitats and habitat components, and voluminous research into their use of the landscape provides insights into habitat used by numerous other species.</p> <p>The Forest Plan identifies the components of elk habitat that need to be addressed with regard to vegetation management—primarily, hiding cover on summer range and thermal cover on winter range. Elk and elk habitat are discussed at length in the Wildlife Background Report.</p>
Mule Deer	<p>The mule deer is an adaptable and resilient species. In recent decades population numbers have moved up and down in roughly 20 year cycles. Low points occurred in the 1970s and mid-1990s. As of 2014, populations were once again in decline throughout much of Montana. Nonetheless, mule deer remain widespread and common in the Divide landscape and adjacent non-Forest lands</p> <p>Like elk, mule deer serve as a Forest Plan indicator for big game habitat. Aside from this designation, however, the Forest Plan provides little specific management direction for deer. The Plan assumes that management for elk will take care of the needs of deer. While mule deer exhibit behavior and habitat use patterns somewhat different from those of elk, many key habitat components (productive foraging areas, hiding cover, riparian sites, road density, and human-free areas) are important to both. Consequently, effects analyses for elk are assumed to be valid for elucidating potential effects of the project alternatives on mule deer as well. However, the Wildlife Background Report analyzes project effects to mule deer.</p>
Moose	<p>The Shiras moose, a northern Rocky Mountain subspecies, is native to Montana. Moose are be found throughout the Divide landscape, but they are uncommon – a function of their solitary nature coupled with spotted distribution of key habitat around which they focus their activity. Although they move through nearly all types of mountainous habitats, moose seek out productive riparian and subirrigated habitats as foraging sites and spend a large portion of their time there. They will feed on submerged aquatic plants and tall forbs in summer but, above all, they are browsers on tall and mid-sized shrubs. There may be effects of vegetation management on moose. Moose are discussed briefly in the <i>Wetland/Riparian Habitats</i> section.</p>
Bighorn Sheep (sensitive)	<p>Bighorn sheep are have not been identified as resident in the Divide landscape since the early 20th century. The wild sheep, once common, fell victim to early market and subsistence hunting and to disease introduced with domestic sheep. MFWP currently has no plans for reintroduction of bighorn sheep in this area. There will be no further discussion on bighorn sheep.</p>
Whitetail Deer	<p>As with mule deer, white-tailed deer population numbers tend to cycle periodically; and as with mule deer, their populations are currently in decline in much of the state. A large percentage of whitetail habitat is at lower elevation in riparian areas and valleylands, and thus these deer are much less common on the National Forest than mule deer. Whitetail deer are discussed briefly in the <i>Topics not Analyzed in Detail</i> section. Analyses of Elk, Mule Deer, and Wetland/Riparian Habitats serve as surrogates for project effects on whitetail deer.</p>
Other Hunting and Trapping	<p>Mountain lion and black bear hunting are unique enterprises, each of which requires an individual approach different from what works for elk and deer. But in the end, these species are affected by vegetation management in much the same way as are elk—and the analysis of elk security applies to them as well. Mountain lions and black bears are discussed briefly in the <i>Topics not Analyzed in Detail</i> section.</p>

Wildlife Parameter	Analysis Approach
Threatened, Endangered, and Proposed Species	
Grizzly	<p>In 2002, the northern half of the Divide landscape was classified as a “Grizzly Bear Distribution Zone”—a region outside of the NCDE Recovery Zone in which grizzlies were known to be consistently present. In 2013, the southern half of the landscape was added to the Distribution Zone as well (now the ‘Expanded Distribution Zone’). The resident grizzly bear population in this zone appears to be very small, and the bears are seldom observed. The grizzly bear is addressed in the Wildlife Background Report.</p>
Canada Lynx	<p>Lynx and lynx habitat occur in the project area. The lynx is addressed in the Wildlife Background Report. Effects on lynx are assessed according to standards and guidelines in the Northern Rockies Lynx Management Direction (NRLMD) (2007b)—now a part of the Forest Plan.</p>
Forest Service Sensitive Species	
Wolf	<p>Wolf packs have occupied the Divide landscape and areas adjacent to it in the valleys and foothills since 1995: 5 packs were known to have been present in this immediate area between 1995 and 2007. Since then, several new packs have formed within reach of the project area, but all have been removed or greatly reduced by USDA Wildlife Services because of their propensity for preying on domestic livestock. A number of wolves have been observed in or near the project area in the last couple years (2010-2014), but evidence of pack formation has been inconclusive. The USFWS and MFWP have monitored all of the known Divide packs intensively, and the movements and actions of these wolves have been well documented. Helena NF biologists have monitored their presence on National Forest lands, particularly with regard to their activity on grazing allotments. There are no known den or rendezvous sites in the project area. Wolves are addressed briefly in the <i>Topics not Analyzed in Detail</i> section.</p>
Bald Eagle	<p>No active bald eagle nests have been located on HNF lands in the Divide landscape since the rejuvenation of local eagle populations over the last 3 decades. All known nests near the landscape are in the Little Blackfoot drainage on private land to the west. Most resident eagles on the Forest are located along the Missouri River in the Big Belt Range and along the Big Blackfoot River. No quantitative analysis is needed at this point. See also the <i>Biological Evaluation</i> section.</p>
Wolverine	<p>Wolverines are known to exist within the project area. Primary effects associated with the vegetation management include potential disturbance and effects to wolverine habitat. The wolverine is analyzed in the Wildlife Background Report. See also the <i>Biological Evaluation</i> section.</p>
Fisher	<p>The project area is near the eastern range of fisher habitat. Recently, the U.S. Fish and Wildlife Service (USFWS) announced a 12-month finding on a petition to list a distinct population segment of the fisher in its United States Rocky Mountain Range (USNRM) as endangered or threatened. As part of that effort, the USFWS identified a “presumed” historical and current range of fishers in North America. Their data indicate that fishers most likely were not historically present in the project area. Fishers are addressed briefly in the <i>Topics not Analyzed in Detail</i> section. See also the <i>Biological Evaluation</i> section.</p>
Black-backed Woodpecker	<p>There has been little habitat capable of sustaining local black-backed woodpecker populations in the Divide landscape in the past century. The last large fires that created an abundance of suitable dead-tree habitat occurred in the late 19th and early 20th centuries. The MacDonald Pass fire in 2009 and the Beartrap Gulch fire in the 1960’s created a few hundred acres of local habitat, but these were isolated events. Black-backed woodpeckers were reported in the MacDonald Pass burn in 2010 and 2011. Ongoing bark beetle infestations are creating an abundance of dead tree habitat across the landscape. While this plethora of new snags is proving to be a boon for several woodpecker species (hairy, downy, pileated; flickers) it does not appear to be attracting black-backed woodpeckers as would fire-generated snag arrays. Black-backed woodpeckers are addressed briefly in the <i>Topics not Analyzed in Detail</i> section. See also the <i>Biological Evaluation</i> section.</p>

Wildlife Parameter	Analysis Approach
Boreal Toad	While boreal toads range through a variety of upland habitats, they concentrate around riparian/aquatic breeding sites. Potential effects, therefore, are assessed primarily in terms of effects to wetlands and riparian habitat. Boreal toads are addressed briefly in the <i>Topics not Analyzed in Detail</i> section. See the discussion in the <i>Wetlands/Riparian Habitat</i> section discussed in detail in this report. See also the <i>Biological Evaluation</i> section.
Peregrine Falcon	Falcon eyries are located on high cliffs, often near water. Peregrine falcons were extirpated from the Divide landscape in the mid-20th century, and no new occupied eyries have been located in the landscape since the falcons have become re-established in and around the Helena NF (almost entirely in the Big Belt Range) in the early 1990's. No quantitative analysis is needed. See also the <i>Biological Evaluation</i> section.
Flammulated Owl	Flammulated owls utilize open park-like conifer forests, especially ponderosa pine. They require an adequate forage base of large insects and a large snag component. Flammulated owls are addressed in the <i>Dry Forested Habitat</i> section. See also the <i>Biological Evaluation</i> section.
Townsend's Big-eared Bat	These bats inhabit various habitats with caves, tunnels, or trees with loose bark. There is a possibility that they are present in the project area, but none have been found to date. No quantitative analysis is needed. See also the <i>Biological Evaluation</i> section.
Northern Leopard Frog	Leopard frogs have not been found in or near the Divide landscape since the early 1990's, and it is likely that they have been extirpated from the area. The analysis of wetland/riparian habitat will suffice to quantify any potential impacts on leopard frogs, should they be present. See also the <i>Biological Evaluation</i> section.
Plains Spadefoot Toad	Spadefoot toads are associated with prairies often with areas of sandy soil or gravel loam (Werner <i>et al.</i> 2004 pp. 68-71). They are not known to occur in Divide landscape. Spadefoot toads will not be analyzed further. See also the <i>Biological Evaluation</i> section.
Harlequin Duck	Harlequin ducks have never been identified on the Helena NF in the Divide landscape, although they have been reported, rarely, in transit further west on the lower Little Blackfoot River. Harlequin ducks will not be analyzed further. See also the <i>Biological Evaluation</i> section.
Northern Bog Lemming	The northern bog lemming has not been identified in the Divide landscape. Nor have any blocks of suitable habitat (sphagnum bogland) large enough to support them been identified. Analyses addressing riparian habitats and other riparian-dependent species will suffice for this species. See also the <i>Biological Evaluation</i> section.
Management Indicator Species	
Northern Goshawk	<p>The Forest Plan designates the goshawk as an indicator of old-growth forest, although it is more often found in non-old-growth habitats on the Helena NF. Goshawks maintain large home ranges and make use of a variety of habitats within them. They are most commonly associated with mature forest, and they require closed-canopied mature stands for nesting and successfully fledging young. There are known nest sites and territories within the project area.</p> <p>Known goshawk nesting territories are monitored in the field each year, and active nests are checked as many times as needed to determine nesting success. New territories are monitored whenever they are identified. Because goshawks move to new nest sites each year, it's not possible to always all active nests in a given year, but the presence of goshawks on a territory can usually be verified. The mountain pine beetle outbreak has dramatically affected the configuration of goshawk habitat within the project area (and across the Forest as a whole). The goshawk is analyzed in the main body of the Wildlife Background Report.</p>

Wildlife Parameter	Analysis Approach
Pileated Woodpecker	<p>The pileated woodpecker is identified as an old growth-dependent MIS in the Forest Plan. Throughout the Divide landscape, however, pileated woodpeckers are usually found in non-old-growth habitat, with large nesting trees (>30" dbh) being the key habitat component. Availability of insect-prone feeding substrate (typically dead or dying trees) is also important. Observation of pileated woodpeckers is usually fortuitous. The location of observations (of the woodpeckers, by sight or sound, and of their characteristic excavations in trees) are noted and mapped. Observations of pileated woodpeckers are increasing in the Divide landscape as dead trees produced by the mountain pine beetle outbreak continue to proliferate. Pileated woodpecker habitat is analyzed in the <i>Snags and Down Woody Debris</i> section in the Wildlife Background report.</p>
Hairy Woodpecker	<p>The hairy woodpecker is identified as a snag dependent MIS in the Forest Plan. Hairy woodpeckers are relatively common throughout a variety of habitats in the project area, and their numbers are increasing noticeably in forest stands killed by the mountain pine beetles. They are analyzed in the <i>Snags and Down Woody Debris</i> section in the Wildlife Background report.</p>
Marten	<p>The marten is an indicator for the quality of large continuous blocks of mature cover. Marten use mature/old-growth spruce/fir and lodgepole pine stands for denning. Stumps and downed logs are critical components. Fragmentation of coniferous cover through historical and recent logging and roading has reduced habitat suitability, and trapping has reduced marten numbers directly. Ongoing bark beetle infestation may have mixed implications for marten—increasing the availability of large snags and logs but reducing the availability of mature forest overstory. The primary habitat parameter is the availability of mature forest with abundant coarse woody debris. They are further analyzed in the <i>Snags and Down Woody Debris</i> section in the Wildlife Background report.</p>
<p style="text-align: center;">BLM Sensitive Species</p> <p>(Listed below are those BLM sensitive species with potential to occur in the project area that are not already identified above, under Forest Service Sensitive Species. See the <i>Administration of BLM Sensitive Species</i> Section for a complete list.)</p>	
Spotted Bat	<p>Roosts in arid habitats with cliffs and crevices and forages over meadows, wet-lands, and water bodies. The species is addressed briefly in the <i>Topics not Analyzed in Detail</i> section. See also the <i>Administration of BLM Sensitive Species</i> section.</p>
Brewer's Sparrow	<p>Habitat includes short-grass prairie with scattered or abundant sagebrush, or other arid shrub habitats. The species is addressed briefly in the <i>Topics not Analyzed in Detail</i> section. See also the <i>Administration of BLM Sensitive Species</i> section.</p>
Golden Eagle	<p>Prefers open habitats and nests on cliffs or large trees. This species has not been identified in the project area. No quantitative analysis is needed. See also the <i>Administration of BLM Sensitive Species</i> section.</p>
Three-toed Woodpecker	<p>Breeds and forages in conifer forests with high incidence of insect infestation from fire, disease, or wind throw. Three-toed woodpeckers are discussed briefly in the <i>Snags and Down Woody Debris</i> section. See also the <i>Administration of BLM Sensitive Species</i> section.</p>

Appendix B, Tenmile – South Helena Project Hiding Cover Methodology and Field Validation

Introduction

The hiding cover analysis for the Tenmile – South Helena project utilizes the Montana Department of Fish, Wildlife, and Parks (MFWP) definition included in the Forest Plan (USDA 1986, p. II/18): a stand of coniferous trees having a crown closure of greater than 40 percent. The 40 percent canopy cover metric is an acceptable ‘proxy’ for mapping hiding cover as it is generally assumed that stands with 40 percent canopy cover or greater would in turn provide adequate vertical structure that would hide 90 percent of an elk at 200 feet, the functional definition of hiding cover. This relationship of canopy cover and stand structure is based on modeling done by Lonner and Cada (1982) and others (e.g. Leckenby et al. 1985, Thomas et al. 1988) who used canopy cover to predict the relationship between hiding cover (as estimated by canopy cover), road densities, and harvest rate the first week of the general hunting season.

Canopy cover is defined as the proportion of the forest floor covered by the vertical projection of tree crowns (Jennings et al. 1999) (Figure 123). Canopy cover spatial data used to map hiding cover are derived from R1-VMap based in part on the following documents: the R1 Multi-level Vegetation Classification, Mapping, Inventory, and Analysis System (USDA 2009a), and Region 1 Existing Vegetation Classification System and its Relationship to Region 1 Inventory Data and Map Products (USDA 2011).

Specifically, the parameters used to map hiding cover include polygons with greater than 40 percent canopy cover and greater than 40 acres in size (USDA 2009b). Timber harvest or other activities that affect vegetation that have occurred within the last 15 years are removed from consideration as hiding cover even if the canopy cover and patch size criteria are met. This is based on the assumption that the trees within these areas are not tall enough to hide elk. So, even though tree height is not a parameter used to map hiding cover, it is accounted for by removing from consideration as hiding cover those stands within which vegetation management has occurred in the last 15 years.

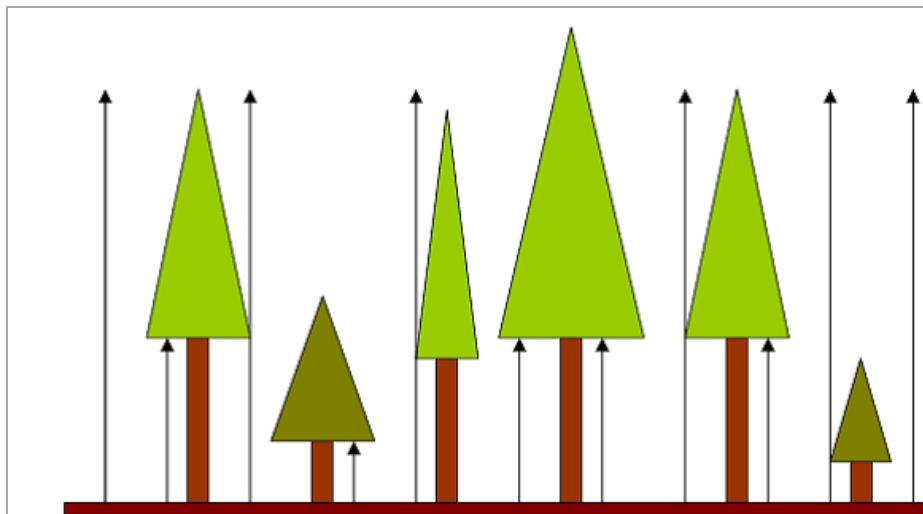


Figure 123. Illustration of canopy cover (from Nuttle 1997 and Jennings et al. 1999).

Elk hiding cover data have been collected in Tenmile/South Helena project area since 2009 to (1) validate that 40 percent canopy cover does provide the functional attributes of hiding cover – i.e. the ability to hide 90 percent of an elk at 200 feet and (2) validate the premise that even though the MPB outbreak has resulted in canopy cover losses, while the trees remain standing they will continue to provide functional hiding cover.

Methods

The following process was used to identify sample points:

1. Random points were generated in GIS. GIS is a geographic information system that integrates hardware, software, and data for capturing, managing, analyzing, and displaying all forms of geographically referenced information.
2. Data were collected at each cardinal direction for each point using a cover board. Thus, four measurements were taken at each point.
3. The percent of the cover board that was screened was recorded for each measurement.
4. At least one measurement needed to be greater than 90 percent in order to consider that point ‘capable of hiding 90 percent of an elk at 200 feet’.

Results

We collected data at 897 points from 2009 through 2014 (Table B-1) in the Tenmile/South Helena project area and in that portion of the Telegraph project area that overlaps with the Tenmile/South Helena project. Of those, 847 points had at least one measurement that was greater than 90 percent. This represents 94 percent of the sample points (Figure 124).

Table 260. Cover board survey results for elk hiding cover 2009 - 2013

Year	Number of Points Surveyed	Number of Plots that are Capable of Hiding 90% of an Elk at 200 Feet	Percent of ‘Capable’ Plots
<i>Tenmile/South Helena project area</i>			
2010	180	173	96%
2011	30	28	93%
2013	363	337	93%
2014	133	129	97%
<i>Telegraph project area that overlaps with the Tenmile/South Helena project area</i>			
2009 - 2013	191	180	94%
TOTAL	897	847	94%

Conclusions

Our data support that (1) polygons with greater than 40 percent canopy cover do provide functional hiding cover most of the time and (2) standing dead trees still function as hiding cover in the absence of canopy cover. This makes sense since it’s the vertical and horizontal structure of a stand that provides screening capabilities and not necessarily the canopy cover. The higher Forest Plan threshold associated with the MFWP definition (i.e. 50 percent) is most likely to account for the fact that some polygons with greater

than 40 percent canopy cover do not provide hiding cover due to viewing angle, topography, and other factors (Canfield et al. 1986, Edge and Marcum 1991).

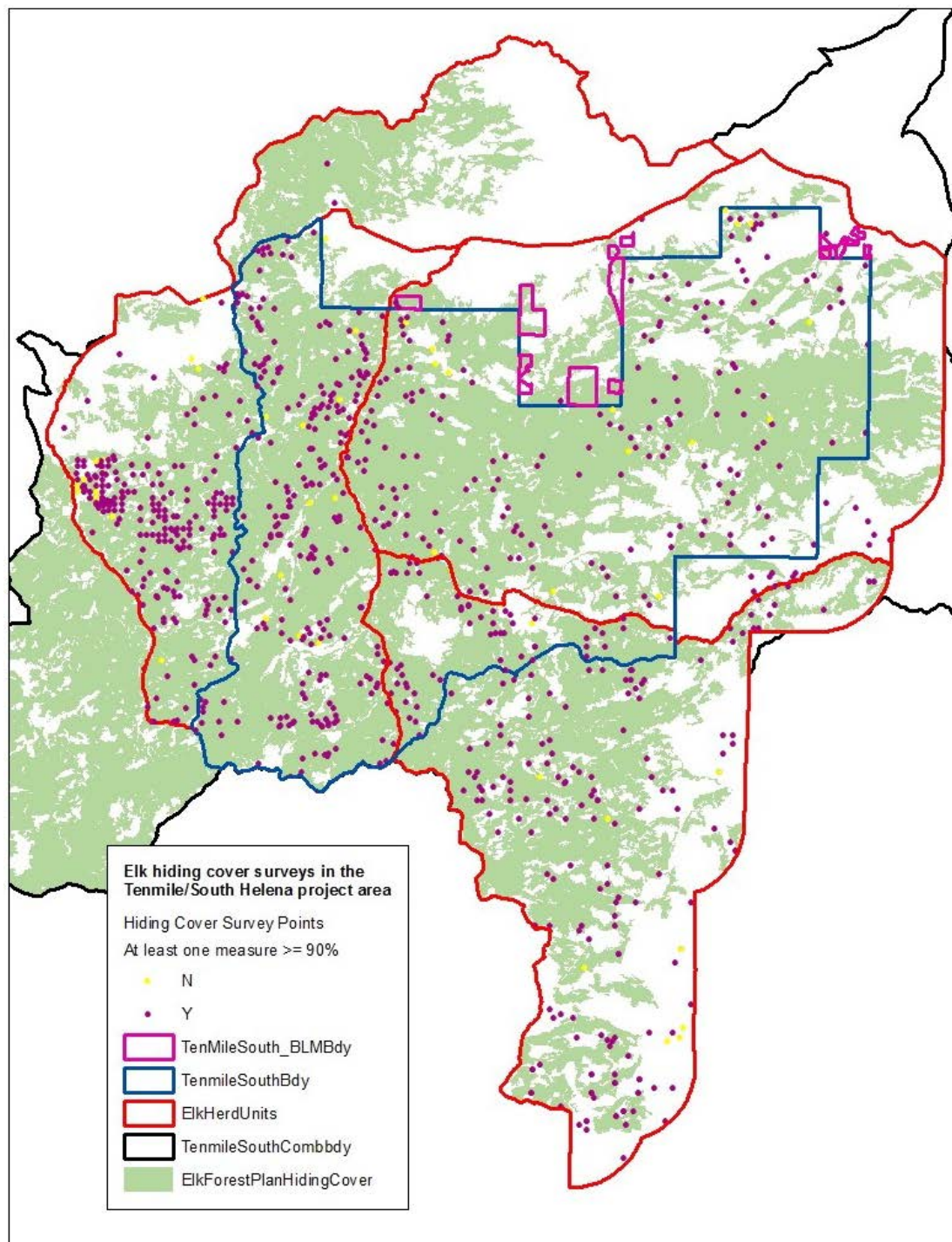


Figure 124. Elk hiding cover survey points in the Tenmile – South Helena project area.

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Appendix C, Consistency with NRLMD objectives, standards and guidelines for the action alternatives²⁵

Table 261. Project consistency with NRLMD objectives, standards, and guidelines.

Northern Rockies Lynx Management Direction	Consistency with the Action Alternatives
ALL MANAGEMENT PRACTICES AND ACTIVITIES (ALL) <i>The following objectives, standards and guidelines apply to management projects in lynx habitat in lynx analysis units (LAU) and in linkage areas, subject to valid existing rights. They do not apply to wildfire suppression, or to wildland fire use</i>	
Objective³⁰ ALL O1 Maintain ²⁶ or restore ³⁹ lynx habitat ²³ connectivity ¹⁶ in and between LAUs ²¹ , and in linkage areas ²² .	The forested character of the area would be retained and connectivity within and between LAUs would be maintained. The project would have no effect upon lynx linkage area and both action alternatives meet ALL O1.
Standard⁴³ ALL S1 New or expanded permanent developments ³³ and vegetation management projects ⁴⁸ must maintain ²⁶ habitat connectivity ¹⁶ in an LAU ²¹ and/or linkage area ²² .	The project area is to the east of the continental divide which has been identified as a linkage area in the NRLMD. The project maintains the general forested nature of the action area as well as landscape connectivity permitting broader lynx movements. Habitat connectivity is maintained although lynx may need to adjust movement patterns during project implementation. Given that harvest and prescribed burn patterns would match historical patterns; these anticipated shifts would be no greater than what lynx would typically do after small to moderate-sized natural disturbances. Standard is met.
Guideline¹⁵ ALL G1 Methods to avoid or reduce effects on lynx should be used when constructing or reconstructing highways ¹⁸ or forest highways ¹² across federal land. Methods could include fencing, underpasses or overpasses.	The project does not include construction or reconstruction of highways or forest highways. Guideline is not applicable.
Standard LAU S1 <i>Changes in LAU²¹ boundaries shall be based on site-specific habitat information and after review by the Forest Service Regional Office.</i>	LAU boundaries have not been changed. Standard is not applicable.

²⁵ Superscript numbers refer to definitions in the glossary of the NRLMD.

Northern Rockies Lynx Management Direction	Consistency with the Action Alternatives
<p><u>VEGETATION MANAGEMENT PROJECTS (VEG)</u> <i>The following objectives, standards and guidelines apply to vegetation management projects in lynx habitat in lynx analysis units (LAU). With the exception of Objective VEG O3 that specifically concerns wildland fire use, the objectives, standards and guidelines do not apply to wildfire suppression, wildland fire use, or removal of vegetation for permanent developments like mineral operations, ski runs, roads and the like. None of the objectives, standards, or guidelines applies to linkage areas.</i></p>	
<p><u>Objective VEG O1</u> – Manage vegetation to mimic or approximate natural succession and disturbance processes while maintaining habitat components necessary for the conservation of lynx.</p>	<p>The action alternatives are designed to mimic landscape patterns and create conditions that would increase the resiliency of the project area to natural disturbance processes.</p>
<p><u>Objective VEG O2</u> – Provide a mosaic of habitat conditions through time that support dense horizontal cover and high densities of snowshoe hares. Provide winter snowshoe hare habitat in both the stand initiation structural stage and in mature, multi-story conifer vegetation.</p>	<p>The action alternatives are designed to regenerate dead lodgepole pine which will in turn increase stand initiation habitat in about 15 years post-treatment. Intermediate harvest is designed to accelerate multistory development.</p>
<p><u>Objective VEG O3</u> – Conduct fire use activities to restore ecological processes and maintain or improve lynx habitat.</p>	<p>Prescribed fire proposed in the action alternatives is designed to restore appropriate fire regimes to the project area.</p>
<p><u>Objective VEG O4</u> – Focus vegetation management in areas that have potential to improve winter snowshoe hare habitat but presently have poorly developed understories that lack dense horizontal cover.</p>	<p>The purpose of the project is to be responsive to the mountain pine beetle outbreak in the area; this includes regenerating dead lodgepole pine stands which will give rise to stand initiation habitat and thinning live stands to hasten development of multistory characteristics.</p>
<p><u>Standard VEG S1</u> – Stand initiation structural stage limits Standard VEG S1 applies to all vegetation management⁴⁸ projects that regenerate³⁷ timber, except for fuel treatment¹³ projects within the wildland urban interface (WUI)⁴⁹ as defined by HFRA, subject to the following limitation: Fuel treatment projects within the WUI that do not meet Standards VEG S1, VEG S2, VEG S5, and VEG S6 may occur on no more than 6 percent (cumulatively) of lynx habitat on each administrative unit (a unit is a National Forest). For fuel treatment projects within the WUI see guideline VEG G10. The Standard: Unless a broad scale assessment has been completed that substantiates different historic levels of stand initiation structural stages⁴⁴ limit disturbance in each LAU as follows: If more than 30 percent of the lynx habitat in an LAU is currently in a stand initiation structural stage that does not yet provide winter snowshoe hare habitat, no additional habitat may be regenerated by vegetation management projects.</p>	<p>Early stand initiation structural stage that does not currently provide snowshoe hare habitat exists on about 3% of LAUs di-04 and LAU di-05 and about 1% of LAU di-06. LAU di-03, adjacent to the western edge of LAU di-04, has about 1% in an early stand initiation structural stage. LAU di-02, north of LAU di-05, includes 5% early stand initiation structural stage. Alternative 2, the more aggressive of the two action alternatives in terms of acres treated, would result in LAU di-05 comprising 14% early stand initiation habitat and LAU di-06 would comprise 4% of early stand initiation habitat. There would be no changes to the other LAUs. Standard VEG S1 is met within the LAUs containing the Tenmile South Helena Vegetation Project.</p>

Northern Rockies Lynx Management Direction	Consistency with the Action Alternatives
<p>Standard VEG S2 – Limits on regeneration from timber mgmt. projects Standard VEG S2 applies to all vegetation management⁴⁸ projects that regenerate³⁷ timber, except for fuel treatment¹³ projects within the wildland urban interface (WUI)⁴⁹ as defined by HFRA, subject to the following limitation:</p> <p>Fuel treatment projects within the WUI⁴⁹ that do not meet Standards VEG S1, VEG S2, VEG S5, and VEG S6 may occur on no more than 6 percent (cumulatively) of lynx habitat on each administrative unit (a unit is a National Forest).</p> <p>For fuel treatment projects within the WUI⁴⁹ see guideline VEG G10.</p> <p>The Standard: Timber management projects shall not regenerate³⁷ more than 15 percent of lynx habitat on NFS lands in an LAU in a ten-year period.</p>	<p>Since January 2006, four NEPA project decisions resulted in regeneration of lynx habitat in the three analyzed LAUs. This includes the Forest-wide Hazardous Tree Removal and Fuels Reduction – HFRA Project (LAUs di-04, di-05 and di-06), the Clancy-Unionville Vegetation Manipulation and Travel Management Project (LAUs di-05 and di-06), the Red Mountain Flume Chessman Reservoir Project (LAUs di-05 and di-06), and the Park Lake Hazardous Tree Removal (LAU di-06).</p> <p>Currently, regeneration harvest in LAU di-04 has occurred on 0.06% of lynx habitat on NFS lands within the past ten years. The project would result in the regeneration of less than one acre in this LAU (Alternative 2 – the more aggressive alternative in terms of acres treated) which increases the percent regenerated in a ten year period to 0.07%.</p> <p>Currently, regeneration harvest in LAU di-05 has occurred on about 1% of lynx habitat on NFS lands within the past ten years. The project would result in the regeneration of up to 1,870 acres in this LAU (Alternative 2) which increases the percent regenerated in a ten year period to 15%.</p> <p>Currently, regeneration harvest in LAU di-06 has occurred on about 0.6% of lynx habitat on NFS lands within the past ten years. The project would result in the regeneration of up to 337 acres in this LAU (Alternative 2) which increases the percent regenerated in a ten year period to 4%.</p> <p>Standard is met for all LAUs.</p>

Northern Rockies Lynx Management Direction	Consistency with the Action Alternatives
<p>Standard VEG S5 – Precommercial thinning limits</p> <p>Standard VEG S5 applies to all precommercial thinning³⁵ projects, except for fuel treatment¹³ projects that use precommercial thinning as a tool within the wildland urban interface (WUI)⁴⁹ as defined by HFRA, subject to the following limitation:</p> <p>Fuel treatment projects within the WUI⁴⁹ that do not meet Standards VEG S1, VEG S2, VEG S5, and VEG S6 may occur on no more than 6 percent (cumulatively) of lynx habitat on each administrative unit (a unit is a National Forest).</p> <p>For fuel treatment projects within the WUI⁴⁹ see guideline VEG G10.</p> <p>The Standard: Precommercial thinning projects that reduce snowshoe hare habitat, may occur from the stand initiation structural stage⁴⁴ until the stands no longer provide winter snowshoe hare habitat only:</p> <ol style="list-style-type: none"> 1. Within 200 feet of administrative sites, dwellings, or outbuildings; or 2. For research studies³⁸ or genetic tree tests evaluating genetically improved reforestation stock; or 3. Based on new information that is peer reviewed and accepted by the regional levels of the Forest Service and FWS, where a written determination states: <ol style="list-style-type: none"> a) that a project is not likely to adversely affect lynx; or b) that a project is likely to have short term adverse effects on lynx or its habitat, but would result in long-term benefits to lynx and its habitat; or 4. For conifer removal in aspen, or daylight thinning⁵ around individual aspen trees, where aspen is in decline; or 5. For daylight thinning of planted rust-resistant white pine where 80 % of the winter snowshoe hare habitat⁵⁰ is retained; or 6. To restore whitebark pine. 	<p>Precommercial thinning is proposed in snowshoe hare habitat in LAUs di-05 and di-06. Under Alternative 2, approximately 5 acres of LAU di-05 and 49 acres of LAU di-06 currently in a multi-story or stand initiation structural stage (and thus providing snowshoe hare habitat) are proposed for precommercial thinning. These acres all fall within the WUI, therefore the exception to the standard would be applied.</p> <p>All acres of early stand initiation habitat and stand initiation habitat proposed for treatment outside of the WUI will be field validated and dropped from units if the field validation indicates that these acres are either early stand initiation or stand initiation.</p> <p>Standard is met.</p>

Northern Rockies Lynx Management Direction	Consistency with the Action Alternatives
<p>Standard VEG S6 – Multi-storied stands & snowshoe hare horizontal cover Standard VEG S6 applies to all vegetation management⁴⁸ projects that regenerate³⁷ timber, except for fuel treatment¹³ projects within the wildland urban interface (WUI)⁴⁹ as defined by HFRA, subject to the following limitation:</p> <p>Fuel treatment projects within the WUI⁴⁹ that do not meet Standards VEG S1, VEG S2, VEG S5, and VEG S6 may occur on no more than 6 percent (cumulatively) of lynx habitat on each administrative unit (a unit is a National Forest).</p> <p>For fuel treatment projects within the WUI⁴⁹ see guideline VEG G10.</p> <p>The Standard: Vegetation management projects that reduce snowshoe hare habitat in multi-story mature or late successional forests²⁹ may occur only:</p> <ol style="list-style-type: none"> 1. Within 200 feet of administrative sites, dwellings, outbuildings, recreation sites, and special use permit improvements, including infrastructure within permitted ski area boundaries; or 2. For research studies³⁸ or genetic tree tests evaluating genetically improved reforestation stock; or 3. For incidental removal during salvage harvest⁴¹ (e.g. removal due to location of skid trails). <p>(NOTE: Timber harvest is allowed in areas that have potential to improve winter snowshoe hare habitat but presently have poorly developed understories that lack dense horizontal cover [e.g. uneven age management systems could be used to create openings where there is little understory so that new forage can grow]).</p>	<p>There are 15 acres of vegetation treatments in multistory habitat in LAU di-04 (Alternative 2). All acres are within the WUI. There are 834 acres of vegetation treatments in multistory habitat in LAU di-05 of which 634 are within the WUI. There are 281 acres of vegetation treatments in LAU di-06 of which 92 are in the WUI. All acres of multistory habitat proposed for treatment outside of the WUI will be field validated and dropped from units if the field validation indicates that these acres are multistory habitat. Standard is met.</p>
<p>Guideline VEG G1 – Lynx habitat improvement</p> <p>Vegetation management⁴⁸ projects should be planned to recruit a high density of conifers, hardwoods, and shrubs where such habitat is scarce or not available. Priority should be given to stem-exclusion, closed-canopy structural stage⁴⁴ <i>stands for lynx or their prey (e.g. mesic, monotypic lodgepole stands)</i>. Winter snowshoe hare habitat⁵⁰ should be near denning habitat⁶.</p>	<p>Treatments are proposed in stem exclusion and mid-seral lynx habitat in order to promote structure diversity and encourage tree growth and understory development.</p>
<p>Guideline VEG G4 – Prescribed Fire</p> <p>Prescribed fire³⁴ activities should not create permanent travel routes that facilitate snow compaction. Constructing permanent firebreaks on ridges or saddles should be avoided.</p>	<p>The construction of fire breaks on ridges or saddles would be avoided unless needed to achieve prescribed fire goals.</p>

Northern Rockies Lynx Management Direction	Consistency with the Action Alternatives
<p>Guideline VEG G5 – Habitat for alternate prey species Habitat for alternate prey species, primarily red squirrel³⁶, should be provided in each LAU.</p>	<p>Some red squirrel habitat may be affected by proposed treatments; however, ample untreated areas remain in the project area in both action alternatives.</p>
<p>Guideline VEG G10 – Fuel treatments in the WUI <i>Fuel treatment projects in the WUI⁴⁹ as defined by HFRA^{17, 48} should be designed considering standards VEG S1, S2, S5, and S6 to promote lynx conservation.</i></p>	<p>Overall, the project is designed to be responsive to the mountain pine beetle outbreak in the area, promote desirable regeneration, improve conditions for fire suppression effectiveness as well as firefighter and public safety in the area in the event of a wildfire, and maintain diverse wildlife habitats. These goals are compatible with conservation of lynx habitat. Both action alternatives have been designed with VEG S1, S2, S5, and S6 in mind. Furthermore, Alternative 3 has been designed to minimize effects to lynx habitat while still meeting the purpose and need of the project.</p>
<p>Guideline VEG G11 – Denning habitat <i>Denning habitat⁶ should be distributed in each LAU in the form of pockets of large amounts of large woody debris, either down logs or root wads, or large piles of small wind thrown trees (“jack-strawed” piles). If denning habitat appears to be lacking in the LAU, then projects should be designed to retain some coarse woody debris⁴, piles, or residual trees to provide denning habitat⁶ in the future.</i></p>	<p>Denning habitat is not lacking in the project area. Because of the mountain pine beetle outbreak there are currently about 67 snags per acre on average in the 7-11.9” size class and 7 in the 12-19.9” size class in the project area. These snags will eventually fall to the forest floor creating abundant denning habitat. About 40% of the project area would be treated (Alternative 2) leaving 60% untreated.</p>
<p>LIVESTOCK MANAGEMENT (GRAZ) <i>The following objectives and guidelines apply to grazing projects in lynx habitat in lynx analysis units (LAU). They do not apply to linkage areas.</i></p>	
<p>Guideline GRAZ G1 – Livestock grazing and openings In fire- and harvest-created openings, livestock grazing should be managed so impacts do not prevent shrubs and trees from regenerating.</p>	<p>Prescribed fire, regeneration, and planting units within grazing allotments would be rested at least one growing season following burning to allow for adequate vegetation recovery.</p>
<p>Guideline GRAZ G2 – Livestock grazing and aspen In aspen stands, livestock grazing should be managed to contribute to the long-term health and sustainability of aspen.</p>	<p>Aspen would be favored in all harvest treatments; if post-treatment monitoring indicates that livestock are impeding the ability of aspen to regenerate then appropriate measures would be taken to protect aspen regeneration (e.g. fencing).</p>
<p>Guideline GRAZ G3 – Livestock grazing and riparian areas & willow carrs In riparian areas⁴⁰ and willow carrs³, livestock grazing should be managed to contribute to maintaining or achieving a preponderance of mid- or late-seral stages²⁸, similar to conditions that would have occurred under historic disturbance regimes.</p>	<p>If treatments proposed in the action alternatives result in resource concerns in riparian areas, appropriate measures would be taken to alleviate those concerns.</p>

Northern Rockies Lynx Management Direction	Consistency with the Action Alternatives
<p>Guideline GRAZ G4 – Livestock grazing and shrub-steppe habitats In shrub-steppe habitats⁴², livestock grazing should be managed in the elevation ranges of forested lynx habitat in LAUs²¹, to contribute to maintaining or achieving a preponderance of mid- or late-seral stages, similar to conditions that would have occurred under historic disturbance regimes.</p>	<p>If treatments proposed in the action alternatives result in resource concerns in shrub-steppe habitats, appropriate measures would be taken to alleviate those concerns.</p>
<p>HUMAN USE PROJECTS (HU) The following objectives and guidelines apply to <i>human use projects, such as special uses (other than grazing), recreation management, roads, highways, mineral and energy development, in lynx habitat in lynx analysis units (LAU)</i>, subject to valid existing rights. <i>They do not apply to vegetation management projects or grazing projects directly. They do not apply to linkage areas.</i></p>	
<p>Guideline HU G1 – Ski area expansion & development, inter-trail islands When developing or expanding ski areas, provisions should be made for adequately sized inter-trail islands that include coarse woody debris⁴, so winter snowshoe hare habitat⁴⁹ is maintained.</p>	<p>The project does not include ski expansion or development. Standard is not applicable.</p>
<p>Guideline HU G2 – Ski are expansion & development, foraging habitat When developing or expanding ski areas, foraging should be provided consistent with the ski area's operational needs, especially where lynx habitat occurs as narrow bands of coniferous forest across mountain slopes.</p>	<p>The project does not include ski expansion or development. Standard is not applicable.</p>
<p>Guideline HU G3 – Recreation developments Recreation developments and operations should be planned in ways that both provide for lynx movement and maintain the effectiveness of lynx habitat²³.</p>	<p>The project does not include recreation development. Standard is not applicable.</p>
<p>Guideline HU G4 – Mineral & energy development For mineral and energy development sites and facilities, remote monitoring should be encouraged to reduce snow compaction.</p>	<p>The project does not include mineral & energy development. Standard is not applicable.</p>
<p>Guideline HU G5 – Mineral & energy development, habitat restoration For mineral and energy development sites and facilities that are closed, a reclamation plan that restores³⁹ lynx habitat should be developed.</p>	<p>The project does not include mineral & energy development. Standard is not applicable.</p>
<p>Guideline HU G6 – Roads, upgrading Methods to avoid or reduce effects to lynx should be used in lynx habitat when upgrading unpaved roads to maintenance levels 4 or 5, if the result would be increased traffic speeds and volumes, or a foreseeable contribution to increases in human activity or development.</p>	<p>Some road reconstruction will occur as part of the action alternatives to improve routes used for hauling. This is primarily to reduce resource damage that may occur during hauling (e.g. erosion and sediment delivery to adjacent streams). Maintenance levels would not be upgraded as a result of these road improvements.</p>

Northern Rockies Lynx Management Direction	Consistency with the Action Alternatives
<p>Guideline HU G7 – Roads, locations New permanent roads should not be built on ridge-tops and saddles, or in areas identified as important for lynx habitat connectivity¹⁶. New permanent roads and trails should be situated away from forested stringers.</p>	<p>No new permanent roads would be constructed in either action alternative. Standard is not applicable.</p>
<p>Guideline HU G8 – Roads, brushing Cutting brush along low-speed²⁵, low-traffic-volume roads should be done to the minimum level necessary to provide for public safety.</p>	<p>Road maintenance would occur along haul routes, including brushing in some instances, for safety purposes.</p>
<p>Guideline HU G9 – Roads, new On new roads built for projects, public motorized use should be restricted. Effective closures should be provided in road designs. When the project is over, these roads should be reclaimed or decommissioned, if not needed for other management objectives.</p>	<p>Temporary roads that would be built in the action alternatives will be closed to public use. Post-project implementation, these roads will be decommissioned.</p>
<p>Guideline HU G10 – Roads, ski area access <i>When developing or expanding ski areas and trails, access roads and lift termini to maintain and provide lynx security¹⁰ habitat.</i></p>	<p>The project does not include ski expansion or development. Standard is not applicable.</p>
<p>Guideline HU G11 – Snow compaction Designated over-the-snow routes, or designated play areas, should not expand outside baseline areas of consistent snow compaction¹, unless designation serves to consolidate use and improve lynx habitat. This is calculated on an LAU basis, or on a combination of immediately adjacent LAUs. This does not apply inside permitted ski area boundaries, to winter logging, to rerouting trails for public safety, to accessing private inholdings, or to access regulated by Guideline HU G12. Use the same analysis boundaries for all actions subject to this guideline.</p>	<p>The project does not include ski expansion or development. Standard is not applicable.</p>
<p>Guideline HU G12 – Winter access for non-recreation SUP & mineral & energy development Winter access for non-recreation special uses, and mineral and energy exploration and development, should be limited to designated routes⁸ or designated over-the-snow routes⁷.</p>	<p>The project does not include non-recreation SUP or mineral/energy development. Standard is not applicable.</p>
<p>LINKAGE AREAS (LINK) The following objective, standard and guidelines apply to <i>all projects within linkage areas</i>, subject to valid existing rights.</p>	
<p>Standard LINK S1 – Highway or forest highway construction in linkage areas When highway¹⁸ or forest highway¹² construction or reconstruction is proposed in linkage areas²², identify potential highway crossings.</p>	<p>The project does not include highway or forest highway construction. The standard is not applicable.</p>

Northern Rockies Lynx Management Direction	Consistency with the Action Alternatives
Guideline LINK G1 – Land exchanges NFS lands should be retained in public ownership.	The project does not include land exchanges. The standard is not applicable.
Guideline LINK G2 – Livestock grazing in shrub-steppe habitats <i>Livestock grazing in shrub-steppe habitats⁴² should be managed to contribute to maintaining or achieving a preponderance of mid- or late-seral stages²⁸, similar to conditions that would have occurred under historic disturbance regimes.</i>	The project is not an allotment management plan. The standard is not applicable.

Appendix D, Viability Analysis

The status of wildlife populations, as we currently understand their distribution on the Helena National Forest (HNF), and their habitats are examined in this section in order to address Forest Plan and Agency requirements that: (1) “viable populations of existing native and desirable non-native plant and animal species are maintained” (Forest Plan II/17) and (2) management activities do not cause a trend towards listing for species that have been identified as sensitive on the Region One Sensitive Species List. This section is applicable for the Helena National Forest only in keeping with Forest Plan and Manual Requirements (USDA 1986, p. II/17 and FSM 2005, 2009). The BLM does not require viability determinations (See USDI 6840 Special Status Species Management 2008)

Summary of Population Viability Status

Forest Service Region One defines a viable species as “consisting of self-sustaining populations that are well distributed throughout the species range.” Self-sustaining populations are “sufficiently large, and have sufficient genetic diversity to display the array of life history strategies and forms that will provide for their persistence and adaptability in the planning area over time” (Samson 2006 updated in USDA 2008). The following table summarizes the type of data available for each MIS and for the wolverine, a sensitive species. The wolverine is the only sensitive species analyzed since it’s the only one analyzed in detail in the Wildlife Background Report. Ratings for other sensitive species not included in the following table can be found in the Biological Evaluation section.

Table 262. Primary information sources for determining population viability of MIS and sensitive species in the project area and the HNF.

Indicator/ Sensitive Species	Presence/ Absence Surveys by Protocol	Presence/ Absence Surveys Random	Intermittent Species Observations	Comprehensive Habitat Modeling	R1 Conservation Assessment	Habitat Surveys
Elk	X			X		X
Mule Deer	X			X		X
American Marten				X	X	
Northern Goshawk	X	X	X	X	X	X
Pileated Woodpeck er	X	X	X	X	X	X
Hairy Woodpeck er	X	X	X	X		X
Wolverine	X	X	X	X		

Viability ratings for elk and mule deer are based on annual tallies of individuals in the field, usually by MFWP. Extensive data on suitable habitat is also available for elk and mule deer, through Forest-wide habitat modeling and systematic field surveys. Ratings for goshawk and hairy woodpecker are based on wide-ranging, but less complete,

population surveys in the field. This information is sufficient to indicate the general magnitude and distribution of populations in the project area and throughout the Forest Plan area. Availability of suitable habitat has been estimated through Forest-wide habitat models, systematic habitat surveys, or both.

Ratings for wolverine, marten, and pileated woodpecker are more problematic. Population information comes primarily through tallies and mapping of fortuitous and, occasionally, targeted field observations. This demonstrates that the species continue to inhabit the planning area, if not the project area, and it provides a rough indication of how they are distributed. But it is a crude estimator of viability. On the other hand, Regional and Forest-wide habitat models and general field surveys provide a basis for assessing habitat sufficiency.

Based on discussion in the Northern Region Viability Protocol (Samson 1997), a review of the Northern Region Viability Committee Report (Samson 1997 Appendix B), and Habitat Estimates for Maintaining Viable Populations (Samson 2006 updated in USDA 2008) the following qualitative rating system was applied to MIS populations and habitats as a means of assessing at population viability (Table D-2).

Table 263. Rating system for MIS populations and viability.

Rating	Population Distribution and Condition within Potential Habitat	Potential for Population Interaction and Colonization of Empty Habitat	Probability of Population Persistence over 50–100 years
5	Population widely distributed, robust, and resilient	Few limitations on population interactions	Very High: Population large, widespread, relatively stable, highly resilient
4	Population well distributed; variable population density	Some barriers to population interaction and habitat occupancy	High: Population widespread, resilient; no insurmountable decimating factors or habitat problems
3	Population may be widely but sporadically distributed; variable density within suitable patches	Barriers to interaction result in some persistently empty habitat blocks	Moderate: Population widely but sporadically distributed; key habitat may be limited or vulnerable; decimating factors a potential problem
2	Population segments localized; small but may be persistent	Population segments often isolated; limited routes for interaction and recolonization of empty habitat	Low: Population small, subject to stochastic effects; long-term availability of key habitat uncertain
1	Population segments localized, small, ephemeral	Population segments highly isolated; little possibility of interaction or recolonization of empty habitat	Very Low: Populations very small, habitat limited and unstable; highly vulnerable to stochastic effects

The ratings in the following table apply to potential habitat for the HNF as a whole. In some cases, the project area contributes to maintaining viability of these populations but is not sufficient in and of itself to encompass or support a self-contained viable population or subpopulation. Given the lack of quantitative data, it is not possible to define a precise timeframe for probability of persistence. But, in general, it is intended to

apply to the long term: the probability that the population would persist for 50–100 years within the Helena National Forest Plan Area (Samson 1997).

Table 264. MIS and sensitive species potential habitat for the HNF.

Indicator/ Sensitive Species	Population Distribution Rating	Population Interaction Rating	Estimated Probability of Population Persistence	Comments
Elk	5	4	5	Elk populations on the HNF are robust. Habitat is ubiquitous. These conclusions follow from detailed annual population monitoring by MFWP and extensive habitat surveys by the Helena NF. Local barriers to elk movement are common, but no substantial blocks of elk habitat are isolated. In spite of local habitat problems, elevated predation in some areas, and persistent hunting pressure in others, long-term viability of elk populations is not a concern.
Mule Deer	5	4	5	Mule deer are widely distributed across the Helena NF and surrounding areas. Habitat is ubiquitous. Local impediments to free movement are common, but no substantial blocks of mule deer habitat are isolated. Mule deer often move easily through and inhabit areas of human settlement. Deer populations have cycled up and down over 10-20 year periods for a variety of reasons, but they have never declined to a point where population viability has been at risk. In spite of local habitat problems, predation, and hunting pressure, long-term viability of mule deer populations is not a concern.
American Marten	3	4	4	Primary marten habitat with mature trees and abundant coarse woody debris is patchy but widely distributed in the project area and across the Helena NF. Habitat is most abundant on the Lincoln RD. It is increasing as forests age in areas not affected by mountain pine beetle (mature Douglas-fir, subalpine fir, Engelmann spruce forest). Primary habitat is interconnected by forested travel habitat. Impact of the beetle outbreak is uncertain, as it subtracts mature forest canopy but increases coarse woody debris. Marten are widely distributed, but numbers are unknown. Prospects for long-term viability are good, as long as trapping pressure does not substantially exceed present levels.

Indicator/ Sensitive Species	Population Distribution Rating	Population Interaction Rating	Estimated Probability of Population Persistence	Comments
Northern Goshawk	4	4	4	Mountain pine beetle is reducing habitat—particularly nesting sites—over extensive areas across the Helena NF. Field surveys indicate that goshawks remain widespread; though nesting success may have decreased. Goshawks are capable of nesting in a variety of mature forest configurations and are adapting to changing forest conditions. Enough suitable nesting habitat will remain to support viable populations; but reduction and fragmentation of habitat may lower population in the mid-term. As mature forest habitats regenerate, goshawk populations will return to previous levels.
Pileated Woodpecker	2	2	2	Pileated woodpeckers are uncommon but present in the project area. Field observation suggests that they have increased with the pine beetle infestation. The presence of large nesting/roosting trees is the key to their persistence. This habitat component while not overly abundant is common enough across the Forest to ensure the long term viability of pileated woodpeckers.
Hairy Woodpecker	5	4	5	Hairy woodpeckers are common and well distributed in all forest habitats with insect-supporting trees and cavity potential on the Helena NF. Populations have increased with the pine beetle outbreak. Potential for suitable habitat persistence and woodpecker population viability over the long term is excellent.
Wolverine	3	4	4	The wolverine population on the Helena NF is small but persistent, with the animals ranging through a wide variety of habitats in all 4 Forest landscapes. A small number of wolverines have been documented in the Divide landscape over the past few years. Habitat changes wrought by mountain pine beetles, fire, and forest management are unlikely to suppress the ability of wolverines to persist across the Forest. Travel planning over 2 decades has increased the acreage of non-motorized habitat available to wolverines. Primary limiting factors are trapping mortality and loss of high elevation, snowbound denning habitat due to global warming. At present, such factors on the Helena NF are insufficient to threaten the region-wide viability of wolverines.

Samson (2005; 2006 updated in USDA 2008) in A Conservation Assessment of the Northern Goshawk, Black-backed Woodpecker, Flammulated Owl, and Pileated

Woodpecker in the Northern Region and USDA Forest Service Habitat Estimates For Maintaining Viable Populations of the Northern Goshawk, Black-backed Woodpecker, Flammulated Owl, Pileated Woodpecker, American Marten, and Fisher (Samson 2005; Samson 2006 updated in USDA 2008) summarizes the status of viability for northern goshawks, pileated woodpeckers, and American martens. Pileated woodpeckers, flammulated owls, and fishers are not analyzed in detail for this project.

- The species considered in this analysis are ‘secure’ or ‘apparently secure’ in terms of persistence (NatureServe 2011).
- Below (and not above) a threshold of 20 to 30 percent of habitat amounts, effects of fragmentation (i.e., patch size and isolation) are suggested to have a negative impact on species persistence. Effects of habitat fragmentation on birds are described to be less in the western United States in comparison to those reported in seminal and numerous studies in the Midwest and east.
- No indication exists that forested ecosystems in the Northern Region have reached the 20 to 30 percent threshold of historic. Forested systems in the Northern Region are more extensive than in historic (approximately 1800) times (Hessburg and Agee 2003; Hessburg et al. 2004).
- Comparison of habitat required for a species-specific minimum viable population to that available indicates well-distributed habitat in far excess to that needed, given the natural distribution of species and their habitats as mapped by the Montana Natural Heritage Program, Idaho Birdnet, and the scientific literature.
- Region-wide habitat modeling for the American marten is restricted by the unavailability of sample-based information on large down woody debris and the variability evident in habitat use by martens. Site-specific models for the American marten may need to be adjusted to include resting site and nest site information (based on point observation data) which may or may not influence habitat amount estimates.

Habitat Analysis and Conclusions

Samson (2006) (updated in USDA 2008) identifies critical thresholds needed to maintain population for selected species within the Northern Region of the Forest Service (Table 262). Estimates derived from the Helena National Forest Intensified Grid Summary Database (June 2013) indicate that habitat for these selected species exceeds the critical thresholds identified by Samson (2006 updated in USDA 2008). The models used to generate estimates are based on Samson (2005, 2006 updated in USDA 2008) and USDA (2009).

Table 265. Summary¹ of critical habitat thresholds (acres) to maintain minimum viable populations for three species in Northern Region compared with existing conditions on the HNF (based on intensified grid data)

Species	Critical Thresholds for the HNF Samson (2006, updated in USDA 2008)	Current Habitat Estimates for the HNF based on Intensified Grid Data²
Northern Goshawk	133,436 (nesting and foraging)	361,963 (nesting and foraging)
Pileated Woodpecker (nesting and foraging)	91,923	193,112
American Marten	3,459	293,064
¹ Current habitat estimates are based on the HNF Summary Database (June 2013 Data). ² Estimates are derived by multiplying the percentage of forested data points identified as a given species habitat by the total forested acres on the Helena National Forest (approximately 929,860 acres according to updated ownership and grid data).		

This table gives a sense of the factors important to maintaining viability some of the MIS in the project area that are particularly vulnerable to habitat loss. At present, the primary factor influencing the viability and quality of habitat for these species is the mountain pine beetle outbreak, which has killed lodgepole and ponderosa pine trees over hundreds of thousands of acres on the Forest. Long-term population viability for these species will be determined by their ability to adapt to the new habitat configurations and to maintain a persistent, if somewhat modest presence, in Helena NF landscapes until forests recover their former structure.

Forest-wide habitat continues to remain above critical thresholds for the three species identified in Table 262 even considering habitat removal associated with the action alternatives. Acres of habitat treated for these species would not result in a breach of the critical thresholds. Therefore, viability for these species appears sound and would remain so upon implementation of proposed treatments regardless of alternative selected.

Viability for wolverine, elk and mule deer, and hairy woodpeckers also appears sound although critical thresholds have not been identified. Elk and mule deer habitat is abundant and well-distributed across the Forest and viability is largely determined through hunting quotas, which are outside the scope of this project. Except for some specific denning-related requirements, wolverines are opportunists and habitat generalists, and are little affected by beetle generated changes. Changes under the action alternatives with the greatest potential to impact wolverines are associated with the human disturbance of project activities. However, this would not be substantial enough to influence population viability.

Hairy woodpeckers inhabit a wide variety of environments with dead, dying, or other insect prone trees. Given the widespread availability of foraging and nesting substrate generated by the mountain pine beetle outbreak, habitat for hairy woodpeckers will be overly abundant across the Forest for several years.

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Appendix E: Cumulative Effects

The cumulative effects analysis is based on a review of those projects/activities included in the Tenmile-South Helena Cumulative Effects Analysis tables. For each species/habitat for which the project may impact, the historic, past (1987-2014), present, and reasonably foreseeable future projects are evaluated for their cumulative effect on wildlife and their habitats.

Cumulative Effects and the Environmental Baseline

The environmental baseline for the wildlife and habitats analyzed in the Specialist Report is a result of the past activities that may have resulted in changes to those habitats. The effects of those past projects in the cumulative effects tables that resulted in the modification of habitat are reflected in the environmental baseline. Specifically, and for example, if vegetation management has occurred in the past, then those changes on the landscape as a result of management are reflected in current acreages for a given species' habitat. These changes are also described in the respective cumulative effects analysis.

Cumulative Effects Analysis Areas

The cumulative effects analysis area is based on the habitat or species of interest and includes:

- Project area
- Elk herd units
- Lynx analysis units
- Combined boundary
- Divide Landscape

Synopsis of Cumulative Effects Relevant to Wildlife

Summary of historic effects

Humans have had an influence on wildlife and their habitat prior to the arrival of the first eastern explorers and settlers. Local Native Americans influenced wildlife through hunting and trapping, setting fires, establishing seasonal encampments, and grazing horses, as well as a variety of other activities. Aside from setting fires, most of these activities were localized or of low intensity such that widespread impacts on wildlife and their habitats were not present. With the arrival of Euro-Americans, major changes occurred to wildlife and their habitats. Beaver were nearly extirpated, riparian areas were dwindling, and mining, particularly on the Helena National Forest, exerted major landscape influences. Primary historic influences on wildlife and their habitats include the following and the extent to which these influence and shape wildlife habitats is reflected in the environmental baseline:

- Road building and maintenance some of which has modified streams, reduced terrestrial habitat, and reduced habitat effectiveness by facilitating human access
- Domestic livestock grazing on public and private lands

- Timber harvest
- Fire suppression that has resulted in shifts in stand structure and composition
- Trapping and hunting which has reduced populations of several species in the Divide Landscape (e.g. wolves, grizzly bears)
- Widespread recreation including dispersed and developed recreation that result in varying degrees of disturbance to wildlife and their habitats
- Dispersed settlement on Forest inholdings
- Wildfire

Summary of past effects (1960-2014), ongoing effects, and reasonably foreseeable effects

Past, Ongoing, and Reasonably Foreseeable activities within or near the project area that continue to influence wildlife include timber management, mineral exploration, grazing management, special use permits, and fuels management, among others. A majority of past regeneration harvest occurred prior to 2000 while fuels treatments spiked from 2000 to 2014 (Figure 125).

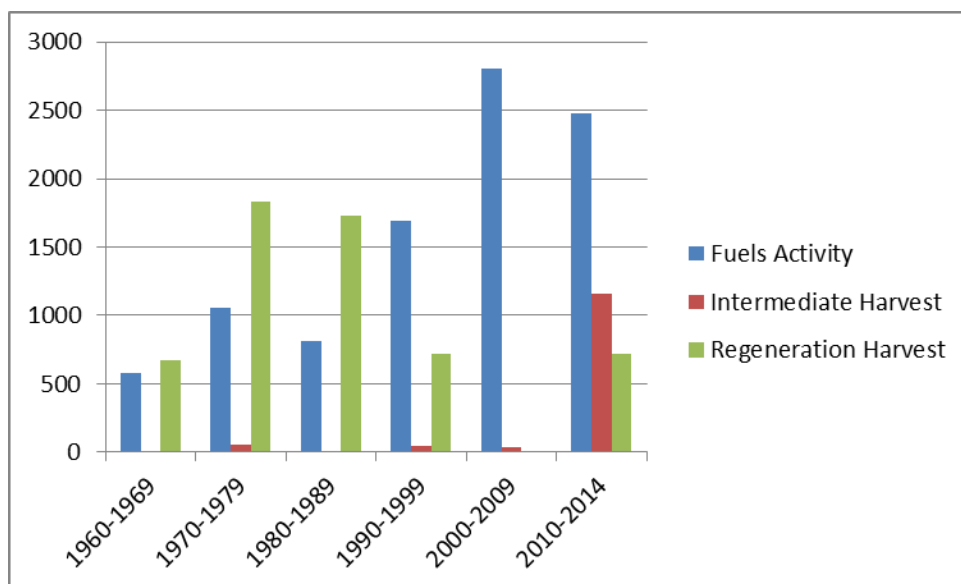


Figure 125. Past harvest and fuels activities in the combined boundary.

Implications of Proposed Action for Cumulative Effects

Contributions of the project to cumulative effects are identified in the following tables. Table 263 summarizes the effects of past vegetative and fuel activities on the composition of the existing vegetation in the project area and combined boundary and the contributions of the alternatives to that condition. Table 264. Additional past activities/projects (excluding harvest, fuels) summarizes the contributions of the alternatives to past activities that are not related to changes in vegetation. Table E-3 summarizes the ongoing activities and Table E-4 summarizes reasonably foreseeable activities. These tables focus on the changes in vegetation and physical parameters (i.e. roads) and how the action alternatives may contribute to these parameters.

Table 266. Past vegetative and fuels activities/projects (E-1)

Decade/Year	Tenmile-South Helena Project Area	Combined Boundary (includes project area)	Effects of Past Activity	Contribution of Project to Cumulative Effects
Forest Service Timber Harvest				
Pre-1960	Regen Harvest: 0 acres Intermediate Harvest: 0 acres Total: 0 acres	Regen Harvest: 17 acres Intermediate Harvest: 0 acres Total: 17 acres	Stands in which regeneration harvest activity occurred from the 1960s through the 1970s currently comprise pole sized trees (5-10" dbh). Stands of intermediate harvest treatments include larger trees and more open-grown conditions and developing understories. The past regeneration harvest treatments (611 acres in the Jericho EHU, 564 acres in Quartz Creek EHU, and 436 acres in Black Mountain-Brookline Bridge EHU) currently provide hiding cover for mule deer and elk but it is unlikely that these areas are thermal cover today. The areas of intermediate harvest (16 acres in the Jericho EHU, 0 acres in Quartz Creek EHU, and 1 acres in Black Mountain-Brookline Bridge EHU), while there would be hiding cover characteristics in some areas, mainly contribute to thermal cover and foraging habitat today except in those areas where MPB associated mortality has resulted in a loss of canopy cover. Many of the roads that were built to facilitate timber harvest remain today and are reflected in the open road densities in the existing conditions. Habitat for species that depend on large tree structure and at least 30% canopy cover is available today in those areas for which intermediate harvest was implemented. These areas are generally composed of larger trees with developing understories that are beneficial to fisher, flammulated owls, goshawks, pileated and hairy woodpeckers, and martens. Regeneration harvest treatments currently provide	Timber harvest activities that occurred from pre-1960 through the 1970s are reflected in the environmental baseline through R1-VMAP and FIA/Intensified Grid Data that reflect the current vegetation condition in the project area. Alternative 1 will not directly add to the past harvest activities. The ongoing mountain pine beetle outbreak will result in more regenerating stands. Snags would not be removed nor would aspen stands be enhanced. Alternatives 2 would result in 4,050 acres of regeneration harvest and 2,955 acres of intermediate harvest. The intermediate treatments would add to the amount of open stand structure and enhance growth and vigor in treated stands. Regeneration harvest would result in the creation of early successional stages that are no longer apparent on the landscape as a result of past timber harvest during this time period. Snags will be removed during timber harvest and created during prescribed fire. Whitebark pine, where present, and aspen will be emphasized adding to the past cumulative effects that maintained or created these conditions. Alternative 3 would result in 2,450 acres of regeneration harvest and 1,827 acres of intermediate harvest. Results are the same as described above.
1960-1969	Regen Harvest: 45 acres Intermediate Harvest: 3 acres Total: 48 acres	Regen Harvest: 673 acres Intermediate Harvest: 4 acres Total: 724 acres		

1970-1979	<p>Regen Harvest: 444 acres Intermediate Harvest: 0 acres Total: 444 acres</p>	<p>Regen Harvest: 1,835 acres Intermediate Harvest: 53 acres Total: 1,888 acres</p>	<p>foraging habitat for goshawks and roosting thickets for flammulated owls. For most other species, these areas have not yet developed structural characteristics to meet minimum habitat requirements. However, in areas where shelterwood treatments were utilized, habitat characteristics have sufficiently developed to provide habitat for species associated with forests that are greater than 30% canopy cover.</p> <p>Past harvest during this time period most likely resulted in snag reduction. Aspen would not have been cut but may have benefitted where competing conifers were removed. Ponderosa pine and other dry open forest types most likely were cut and/or may have also benefitted from timber harvest that created open stand conditions. Whitebark pine most likely was not impacted as it was not considered a merchantable species.</p> <p>Past regeneration harvest in lynx habitat 1,629 acres in di-04, 133 acres in di-05, and 867 acres in di-06) and intermediate harvest (50 acres in di-04, 0 acres in di-05, and 1 acre in di-06) during this time period is likely in the stem exclusion stage in lodgepole pine dominated stands.</p>	
1980-1989	<p>Regen Harvest: 299 acres Intermediate Harvest: 0 acres Total: 299 acres</p>	<p>Regen Harvest: 1,725 acres Intermediate Harvest: 4 acres Total: 1,728 acres</p>	<p>Stands in which regeneration harvest activity occurred from the 1980s through the 1990s currently comprise young sapling sized trees (up to 5" dbh). Stands of intermediate harvest treatments include larger trees and more open grown conditions; however, the understories</p>	<p>Timber harvest activities that occurred from the 1980s through the 1990s are reflected in the environmental baseline through R1-VMAP and FIA/Intensified Grid Data that reflect the current vegetation condition in the Project area.</p>

1990-1999	<p>Regen Harvest: 36 acres Intermediate Harvest: 104 acres Total: 168 acres</p>	<p>Regen Harvest: 718 acres Intermediate Harvest: 149 acres Total: 867 acres</p>	<p>aren't as developed as those stands treated in earlier decades.</p> <p>The past regeneration harvest treatments (641 acres in the Jericho EHU, 262 acres in Quartz Creek EHU, and 275 acres in Black Mountain-Brookline Bridge EHU) most likely do not provide hiding cover in those stands treated in the 1990s; stands treated in the 1980s have developed sufficiently to screen elk and provide hiding cover capabilities. These regenerated areas currently do not provide thermal cover except in a few stands where shelterwood treatments were implemented. The areas of intermediate harvest (20 acres in the Jericho EHU, 81 acres in Quartz Creek EHU, and 69 acres in Black Mountain-Brookline Bridge EHU) may provide hiding cover characteristics in those stands that are generally more productive (i.e. cool, moist types); in the drier types stands have not developed to the extent that hiding cover characteristics are provided. Thermal cover has not yet developed in these stands. Many of the roads that were built to facilitate timber harvest remain today and are reflected in the open road densities in the existing conditions.</p> <p>Habitat for species that depend on large tree structure and at least 30% canopy cover is available today in those areas for which shelterwood, patch cut, or single tree selection regeneration harvest techniques were implemented. In areas of intermediate harvest, canopy cover and tree size have not yet developed mature forest structural characteristics since most of these treatments were liberation harvest.</p> <p>Past harvest during this time period most likely resulted in snag reduction. Aspen would not have been cut but may have benefitted where competing conifers were removed. Ponderosa pine and other dry open forest types most likely were cut and/or may have also benefitted from timber harvest that created open stand conditions. Whitebark pine most likely was not impacted as it was not considered a merchantable species.</p> <p>Past regeneration harvest in lynx habitat 1,791 acres in di-04, 339 acres in di-05, and 508 acres in di-06) and intermediate harvest (101 acres in di-04, 24 in di-05, and 149 in di-06) during this time period is likely in the early stand initiation stage or the stand initiation stage, winter snowshoe hare habitat.</p>	<p>Alternative 1 would contribute to the effects of past timber because forested stands that are killed by mountain pine beetles would revert to early seral stages similar to those early seral stands that were created as a result of regeneration harvest from the 1980s through today. There would be no additional areas of mature, open grown forests and the ongoing mountain pine beetle outbreak will result in more regenerating stands. Snags would not be removed nor would aspen stands be enhanced.</p> <p>Alternative 2 would result in 4,050 acres of regeneration harvest and 2,955 acres of intermediate harvest. . The intermediate treatments would add to the amount of open stand structure and enhance growth and vigor in treated stands. Regeneration harvest would contribute to the early successional stands that were created during the 1980's and 1990s as a result of regeneration harvest. Snags will be removed during timber harvest and created during prescribed fire. Whitebark pine and aspen will be emphasized adding to the past cumulative effects that maintained or created these conditions.</p> <p>Alternative 3 would result in 2,450 acres of regeneration harvest and 1,827 acres of intermediate harvest. Results are the same as described above.</p>
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2000-2009	Regen Harvest: 8 acres Intermediate Harvest: 18 acres Total: 26 acres	Regen Harvest: 8 acres Intermediate Harvest: 33 acres Total: 41 acres	Stands in which regeneration harvest activity occurred from 2000 to 2014 are currently in the stand initiation phase with some large remnant trees remaining. Stands of intermediate harvest treatments include larger trees and more open grown conditions; however, the understories are not yet developed.	Timber harvest activities that occurred from 2000 through 2011 are reflected in the environmental baseline through R1-VMAP and FIA/Intensified Grid Data that reflect the current vegetation condition in the Project area. Additional effects of past activities later than 2011 are reflected in wildlife model outputs that take into account recent activities [See <i>Eastside Assessment-Wide Wildlife Habitat Parameters for Results and Expected Trends</i> (2014) and <i>Criteria for Wildlife Models Helena National Forest Version June 2009</i> (USDA 2009a)].
2010-2014	Regen Harvest: 629 acres Intermediate Harvest: 513 acres Total: 1,142 acres	Regen Harvest: 715 acres Intermediate Harvest: 1,156 acres Total: 1,871 acres	<p>The past regeneration harvest treatments (54 acres in the Jericho EHU, 151 acres in Quartz Creek EHU, and 558 acres in Black Mountain-Brookline Bridge EHU) most likely do not yet provide hiding cover or thermal cover. The areas of intermediate harvest (315 acres in the Jericho EHU, 119 acres in Quartz Creek EHU, and 308 acres in Black Mountain-Brookline Bridge EHU) may provide hiding cover characteristics in those stands that are generally more productive (i.e. cool, moist types); in the drier types stands have not developed to the extent that hiding cover characteristics are provided. In most cases, habitat is not present for those species that depend on canopy closure greater than 30% except in those areas of regeneration harvest where large trees were left as either seed trees or as a shelterwood.</p> <p>Past regeneration harvest in lynx habitat (13 acres in di-04, 128 in di-05, and 66 in di-06) and intermediate harvest (292 acres in di-04, 546 in di-05, and 351 in di-06) during this time period is likely in the early stand initiation stage</p> <p>Past harvest during this time period most likely resulted in snag reduction. Aspen would not have been cut but may have benefitted where competing conifers were removed. Ponderosa pine and other dry open forest types most likely were cut and/or may have also benefitted from timber harvest that created open stand conditions. Whitebark pine most likely was not impacted as it was not considered a merchantable species.</p> <p>The above acres include the Forestwide Hazardous Tree Removal and Fuels Reduction Project.</p>	<p>Alternative 1 would contribute to the effects of past timber because forested stands that are killed by mountain pine beetles would revert to early seral stages similar to those early seral stands that were created as a result of regeneration harvest from 2000 through today. There would be no additional areas of mature, open grown forests and the ongoing mountain pine beetle outbreak will result in more regenerating stands. Snags would not be removed nor would aspen stands be enhanced.</p> <p>Alternative 2 would result in 4,050 acres of regeneration harvest and 2,955 acres of intermediate harvest. . The intermediate treatments would add to the amount of open stand structure and enhance growth and vigor in treated stands. Regeneration harvest would contribute to the early successional stands that were created from 2000 to 2014 as a result of regeneration harvest. Snags will be removed during timber harvest and created during prescribed fire. Whitebark pine and aspen will be emphasized adding to the past cumulative effects that maintained or created these conditions.</p> <p>Alternative 3 would result in 2,450 acres of regeneration harvest and 1,827 acres of intermediate harvest. Results are the same as described above.</p>
Forest Service Fuels Activities				
Pre-1960	Total Fuels acres: 0 acres	Total Fuels acres: 34 acres	Fuel activities that occurred during the 1960s and 1970s reduced surface fuels and created more open forest	Fuels activities that occurred from pre-1960 through 2011 are reflected in the environmental

1960-1969	Total Fuels acres: 32 acres	Total Fuels acres: 574 acres	conditions. Many of these areas that have been treated have returned to 'pre-treatment' conditions especially in favorable growing conditions that accelerate understory development. Generally, fuel treatments of this period improved shrub understories and aspen development as well as creating additional snags. In some situations, down woody debris may have been consumed and structural diversity reduced.	<p>baseline through R1-VMAP and FIA/Intensified Grid Data that reflect the current vegetation condition in the Project area.</p> <p>Alternative 1 would not add to the amount of open conditions and would perpetuate understory development and surface fuel accumulations. Snags would not be removed under this Alternative. Shrub, grassland, and aspen communities would not be enhanced either.</p>
1970-1979	Total Fuels acres: 428 acres	Total Fuels acres: 1055 acres		
1980-1989	Total Fuels acres: 85 acres	Total Fuels acres: 808 acres	Fuel activities that occurred during the 1980s and 1990s have also reduced surface fuels and created more open forest conditions. Some of these areas that have been treated have returned to 'pre-treatment' conditions. Fuel activities have promoted shrub and aspen communities.	<p>Alternatives 2 and 3 would result in the prescribed burning of 17,303 and 13,836 acres respectively, creating additional open areas and in the short term affecting understory development and surface fuels accumulations. Treatments would add to landscape heterogeneity and resiliency of stands and contribute to the amount of snags in the project area which are already plentiful. Treatments would also promote aspen, whitebark pine, and shrub and grassland communities adding to some of the past effects on these habitats.</p>
1990-1999	Total Fuels acres: 238 acres	Total Fuels acres: 1,692 acres		
2000-2009	Total Fuels acres: 1,878 acres	Total Fuels acres: 2,809 acres	Fuel activities that occurred from 2000 to present have generally resulted in improved grass and shrublands as well as in the creation of snags. However, these areas are generally more open than other areas of past fuel treatments.	<p>Alternative 1 would not add to the amount of open conditions and would perpetuate understory development and surface fuel accumulations. Snags would not be removed under this Alternative. Shrub, grassland, and aspen communities would not be enhanced either.</p> <p>Alternatives 2 and 3 would result in the prescribed burning of 17,303 and 13,836 acres respectively, creating additional open areas and in the short term affecting understory development and surface fuels accumulations. Treatments would add to landscape heterogeneity and resiliency of stands and contribute to the amount of snags in the project area which are already plentiful. Treatments would also promote aspen, whitebark pine, and shrub and grassland communities adding to some of the past effects on these habitats.</p>
2010-2014	Total Fuels acres: 2,247 acres	Total Fuels acres: 2,477 acres		

Private Land Timber Harvest				
2005-2014	Timber Harvest: 74 acres Total: 74 acres	Timber Harvest: 1,948 acres Total: 1,948 acres	Timber harvest that occurred during this time period has resulted in early successional habitat with some large trees remaining. Timber harvest on private land most likely did not result in any snag retention.	<p>Alternative 1 would contribute to the effects of past timber because forested stands that are killed by mountain pine beetles would revert to early seral stages similar to those early seral stands that were created as a result of regeneration harvest from the 1980s through today. The action Alternatives would add to the amount of open stands created by intermediate harvest on private land and would add to the early successional habitat created by regeneration harvest.</p> <p>Snag reduction associated with all action Alternatives would add cumulatively to snag reduction associated with private timber harvest.</p>

Table 267. Additional past activities/projects (excluding harvest, fuels)

Activity/Project Name	Decade/Year	Tenmile-South Helena Project Area	Combined Boundary (Includes Project Area)	Effects of Past Activity	Contribution of Project to Cumulative Effects
Banner Creek Bridge #1	2014	Deck and curb replacement.		There are no measurable effects to wildlife.	There are no anticipated cumulative effects.
EPA – Landmark Subdivision	2014	Remediation of the Landmark Subdivision. Final property remediation was to be completed in 2014.		Possible temporary displacement of wildlife during project implementation; however, wildlife use of the area should have resumed.	There are no anticipated cumulative effects associated with Alternative 1. The action alternatives may result in temporary displacement of local wildlife which would add to the displacement effects associated with this past project.
Albright Special Use Authorization	2014	This project is the issuance of a new special use authorization to replace existing authorization HEL116, which expires at the end of 2013. The special use authorization is for a domestic well and associated infrastructure.		Possible temporary displacement of wildlife during project implementation; however, wildlife use of the area should have resumed.	There are no anticipated cumulative effects associated with Alternative 1. The action alternatives may result in temporary displacement of local wildlife which would add to the displacement effects associated with this past project.
EPA-Little Lilly/Lee Mountain Complex removal and reclamation	2013		Mine waste removal and reclamation. Also installed groundwater monitoring wells to evaluate arsenic levels pre and post removal.	Possible temporary displacement of wildlife during project implementation; however, wildlife use of the area should have resumed.	There are no anticipated cumulative effects associated with Alternative 1. The action alternatives may result in temporary displacement of local wildlife which would add to the displacement effects associated with this past project.
Sally Anne Road	2011	Aquatic Organism Passage Legacy Road: Road 527 replace undersized Sally Anne culvert with a 12' span by 4' rise by 40' long three sided concrete box culvert.		Possible temporary displacement of wildlife during project implementation; however, wildlife use of the area should have resumed. The project also should have improved riparian conditions.	There are no anticipated cumulative effects associated with Alternative 1. The action alternatives may result in temporary displacement of local wildlife which would add to the displacement effects associated with this past project.

Activity/Project Name	Decade/Year	Tenmile-South Helena Project Area	Combined Boundary (Includes Project Area)	Effects of Past Activity	Contribution of Project to Cumulative Effects
Wakina Sky Trail Relocations	2011	Relocated appx. 1/2 mile of trail from private land to HNF. Old trail made impassable by using dead and down trees and rocks.		Possible temporary displacement of wildlife during project implementation; however, wildlife use of the area should have resumed.	There are no anticipated cumulative effects associated with Alternative 1. The action alternatives may result in temporary displacement of local wildlife which would add to the displacement effects associated with this past project.
Sally Ann Creek Culvert Replacements	2010	Minnehaha Road 527, MP 0.8, remove existing culvert and install one AOP recast 3-sided concrete box culvert 12 foot span X 4 foot rise X 40 feet long; 4 inches new surface aggregate for 240 feet.		Possible temporary displacement of wildlife during project implementation; however, wildlife use of the area should have resumed.	There are no anticipated cumulative effects associated with Alternative 1. The action alternatives may result in temporary displacement of local wildlife which would add to the displacement effects associated with this past project.
Minnehaha Road	2010	Legacy Road: Road 527 recondition 4.9 miles, construct 3 drain dips; 4" new surface aggregate on 1.15 miles; install 36 new 18" culverts; replace 2 undersized culverts w/ larger culvert		Possible temporary displacement of wildlife during project implementation; however, wildlife use of the area should have resumed.	There are no anticipated cumulative effects associated with Alternative 1. The action alternatives may result in temporary displacement of local wildlife which would add to the displacement effects associated with this past project.
MT Army National Guard	2010	Permit for winter survival training on MacDonald Pass.		Possible temporary displacement of wildlife during project implementation; however, wildlife use of the area should have resumed.	There are no anticipated cumulative effects associated with Alternative 1. The action alternatives may result in temporary displacement of local wildlife which would add to the displacement effects associated with this past project.

Activity/Project Name	Decade/Year	Tenmile-South Helena Project Area	Combined Boundary (Includes Project Area)	Effects of Past Activity	Contribution of Project to Cumulative Effects
Hahn Creek Roads	2010		American Restoration & Recovery Act: Road 495 replace undersized Hahn Creek culvert w/ a 123" span by 83" rise by 40' corrugate steel pipe arch. Road 1856 replace undersized culvert w/ a 123" span by 83" rise by 40' corrugate steel pipe arch	Possible temporary displacement of wildlife during project implementation; however, wildlife use of the area should have resumed.	There are no anticipated cumulative effects associated with Alternative 1. The action alternatives may result in temporary displacement of local wildlife which would add to the displacement effects associated with this past project.
National Guard High Elevation Helicopter Landing Training	2010	MT National Guard requested to conduct helicopter pilot training at various peaks on the Helena National Forest as well as water bucket training. Red Mtn., Treasure Mtn., Negro Mtn., Hog Back, and Lava Mtn.		Possible temporary displacement of wildlife during project implementation; however, wildlife use of the area should have resumed.	There are no anticipated cumulative effects associated with Alternative 1. The action alternatives may result in temporary displacement of local wildlife which would add to the displacement effects associated with this past project.
Telegraph Creek Roads	2009-2010		American Restoration & Recovery Act: Road 495 reconstruct 4.1 miles; 4" new surface aggregate for 4.1 miles; dust palliative 1.4 miles; install 24 new 18" culverts; replace 5 undersized culverts w/ larger culverts Road 1856 install 7 new culverts; replace 4 undersized culverts w/ larger culverts Road 1857 install 7 new culverts	Possible temporary displacement of wildlife during project implementation; however, wildlife use of the area should have resumed. Also, the location along an open road system dilutes its impact for most species.	There are no anticipated cumulative effects associated with Alternative 1. The action alternatives may result in temporary displacement of local wildlife which would add to the displacement effects associated with this past project.

Activity/Project Name	Decade/Year	Tenmile-South Helena Project Area	Combined Boundary (Includes Project Area)	Effects of Past Activity	Contribution of Project to Cumulative Effects
Clancy Grazing Allotment	2009		Signed EA reauthorizing grazing using an adaptive management strategy.	This retained the basic pattern of competition for forage on summer range between cattle and native grazers, but continued the trend of reducing competition in key areas and improving range condition with each AMP revision.	Alternative 1 could contribute cumulative effects due to forage conditions that are expected to improve in forested understories as a result of mountain pine beetle related mortality. The action alternatives could also contribute cumulatively as a result of treatments in dead and dying stands that will open up those stands thereby improving forage.
MacDonald Pass Wildfire	2009	Wildfire that burned approximately 170 acres in 2009.		This fire created ~ 170 acres of black-backed woodpecker habitat that has been verified by field surveys since 2010. This fire is reflected in the baseline.	There are no anticipated cumulative effects associated with Alternative 1. Alternatives 2 and 3 could add to conditions created by this wildfire somewhat through the prescribed fire treatments. Although, the severity of prescribed fire would likely be less than that of the wildfire.
Road Drainage Repairs	2009	Roads 123, 227, 495, 495-D1, 495-E1, 527, 1856, 1856-D1, 1856-E1, 1856-J1, 1857, 1857-D1, 1863, 1863-A1 and 4104; Blading 43.2 miles, construct drain dips 231.		Possible temporary displacement of wildlife during project implementation; however, wildlife use of the area should have resumed.	There are no anticipated cumulative effects associated with Alternative 1. The action alternatives may result in temporary displacement of local wildlife which would add to the displacement effects associated with this past project.
U.S. Hwy 12 Improvements	October 2009		Removal of vegetation (4 to 5 log truck loads), installation of guard rails, erosion protection, and sanding/salting.	Possible temporary displacement of wildlife during project implementation; however, wildlife use of the area should have resumed. Also, the location along an open road system dilutes its impact for most species.	There are no anticipated cumulative effects associated with Alternative 1. The action alternatives may result in temporary displacement of local wildlife which would add to the displacement effects associated with this past project.

Activity/Project Name	Decade/Year	Tenmile-South Helena Project Area	Combined Boundary (Includes Project Area)	Effects of Past Activity	Contribution of Project to Cumulative Effects
Continental Divide Trailhead (CDNST)	July 2009		Construction of approximately seven miles of new CDNST to reroute the trail to the Continental Divide. This new segment connects to the Bison Creek Area where the CDNST trail leads onto the neighboring Beaverhead-Deerlodge National Forest.	New trail construction on the Helena NF (1) substitutes new foot trail for routes that formerly followed roads (open and closed) or (2) moves existing trail out of problematic locations (stream bottoms, wet meadows, etc.). Given the relatively low-key use, effects are usually beneficial or neutral for wildlife except during project implementation.	There are no anticipated cumulative effects associated with alternative 1. The action alternatives may result in temporary displacement of local wildlife which would add to the displacement effects associated with this past project.
Chessman Road Reconditioning	2008	Chessman Rd. 299 reconditioning of 4.4 miles; spot surface road with 600CY pit run aggregate.		Possible temporary displacement of wildlife during project implementation; however, wildlife use of the area should have resumed.	There are no anticipated cumulative effects associated with alternative 1. The action alternatives may result in temporary displacement of local wildlife which would add to the displacement effects associated with this past project.
Park Lake and Chessman Roads	2008	Park Lake Rd. 4009 recondition 6.2 miles; 4 inches new surface aggregate for 3.7 miles; install one 18 inch and one 30 inch culvert. Chessman Rd. 299 reconditioning of 0.9 miles; construct 4 drain dips.		Possible temporary displacement of wildlife during project implementation; however, wildlife use of the area should have resumed. Also, the location along an open road system dilutes its impact for most species.	There are no anticipated cumulative effects associated with alternative 1. The action alternatives may result in temporary displacement of local wildlife which would add to the displacement effects associated with this past project.
Zuconni Private Road	2008		Road construction of about 2,000 feet	Possible temporary displacement of wildlife during project implementation; however, wildlife use of the area should have resumed.	There are no anticipated cumulative effects associated with alternative 1. The action alternatives may result in temporary displacement of local wildlife which would add to the displacement effects associated with this past project.

Activity/Project Name	Decade/Year	Tenmile-South Helena Project Area	Combined Boundary (Includes Project Area)	Effects of Past Activity	Contribution of Project to Cumulative Effects
Blackhall Meadows Stream Gully Restoration	2007	Stabilize an eroding gully by reshaping steep cut-banks to a gradual angle, installing logs, rocks, and/or erosion control fabric to alleviate head cutting. Also, re-vegetate bare soil with native plants and fence site to exclude cattle.		Possible temporary displacement of wildlife during project implementation; however, wildlife use of the area should have resumed.	There are no anticipated cumulative effects associated with alternative 1. The action alternatives may result in temporary displacement of local wildlife which would add to the displacement effects associated with this past project.
Spring Hill Land Exchange	2007	Exchange of private lands for NFS lands to consolidate land ownership and to improve administration of those lands. T 9 N, R 4 W.		Beneficial to wildlife as these lands will remain undeveloped.	No anticipated cumulative effects.
Tri-Arabian Horse Club Judged Trail Ride	2007		This special recreation use permit authorized the Club to use existing trails and routes located west of Helena, Montana in the Sweeney Creek area. This non-motorized event authorized up to 75 participants and spectators and occurred from September 9 and 10, 2007.	Possible temporary displacement of wildlife during project implementation; however, wildlife use of the area should have resumed.	No anticipated cumulative effects.
Clancy Unionville AMP	2006	Allotment management plan for the Clancy Unionville area.		This retained the basic pattern of competition for forage on summer range between cattle and native grazers, but continued the trend of reducing competition in key areas and improving range condition with each AMP revision.	Alternative 1 could contribute cumulative effects due to forage conditions that are expected to improve in forested understories as a result of mountain pine beetle related mortality. The action alternatives could also contribute cumulatively as a result of treatments in dead and dying stands that will open up those stands thereby improving forage.

Activity/Project Name	Decade/Year	Tenmile-South Helena Project Area	Combined Boundary (Includes Project Area)	Effects of Past Activity	Contribution of Project to Cumulative Effects
Continental Divide Trailhead & Connector Trail	August 2005	Construction of trailhead and approximately ½ mile of new road to access the trailhead and approximately ½ mile of connector trail to tie in with the existing Continental Divide National Scenic Trail		New trail construction on the Helena NF (1) substitutes new foot trail for routes that formerly followed roads (open and closed) or (2) moves existing trail out of problematic locations (stream bottoms, wet meadows, etc.). Given the relatively low-key use, effects are usually beneficial or neutral for wildlife except during project implementation.	There are no anticipated cumulative effects associated with alternative 1. The action alternatives may result in temporary displacement of local wildlife which would add to the displacement effects associated with this past project.
Special Use Permit to the U.S. Army/Montana National Guard Sweeney Creek Land Navigation Course	2004		This special use permit authorized the National Guard to use the Sweeney Creek area for land navigation exercises in the spring and fall. Monitoring of wildlife for potential effects was required due to winter range concerns.	Possible temporary displacement of wildlife during project implementation; however, wildlife use of the area should have resumed.	There are no anticipated cumulative effects associated with alternative 1. The action alternatives may result in temporary displacement of local wildlife which would add to the displacement effects associated with this past project.
North Western Corporation Moose Creek Utility Extension	February 2004	This decision authorized the North Western Corp. the installation, use & maintenance of a 0.6kV buried power line in the Moose Crk drainage. This action includes a 30-foot power line & power pole.		Possible temporary displacement of wildlife during project implementation; however, wildlife use of the area should have resumed.	There are no anticipated cumulative effects associated with alternative 1. The action alternatives may result in temporary displacement of local wildlife which would add to the displacement effects associated with this past project.
Bridge and Guardrail Upgrade	2003	Moose Creek Campground Rd. 4180, MP .1, upgrade bridge curbs; Minnehaha Rd. 527, MP 7.9, upgrade bridge guardrails; Banner Cr. Rd. 1876, MP 0.3, Bridge #1, upgrade guardrails, MP 0.8, upgrade curbs; Telegraph Rd 495, MP 0.9, upgrade bridge curbs; Ontario Cr. Rd 123, MP 0.1, Bridge #1, upgrade curb, MP 0.3, Bridge #2, upgrade curbs.		Possible temporary displacement of wildlife during project implementation; however, wildlife use of the area should have resumed.	No anticipated cumulative effects.

Activity/Project Name	Decade/Year	Tenmile-South Helena Project Area	Combined Boundary (Includes Project Area)	Effects of Past Activity	Contribution of Project to Cumulative Effects
Jericho Mountain Continental Divide Trail Reroute	April 2003	This decision implemented new trail construction of approximately 2.2 miles of the CDNST #337 to align the trail to the Continental Divide as per Agency guidance.		Possible temporary displacement of wildlife during project implementation; however, wildlife use of the area should have resumed.	There are no anticipated cumulative effects associated with alternative 1. The action alternatives may result in temporary displacement of local wildlife which would add to the displacement effects associated with this past project.
Eakin Encroachment	2002	Continued use of a small tract on NFS lands currently occupied by an encroaching privately owned garage. A special use permit for occupancy of .04 acres was issued to Kirk and Cathy Eakin.		Possible temporary displacement of wildlife initially; however, wildlife in the area most likely have adjusted their use patterns.	No anticipated cumulative effects.
Touch America, Inc. Fiber Installation	2000		Authorization to install, use and maintain six underground two-inch fiber optic ducts, one duct installed w/ a fiber optic cable, on NFS lands near Hwy 12 on MacDonald Pass using a Construction Special Use Permit followed by a single, consolidated, region wide Special Use Permit. About 1.15 acres within the paved/gravel shoulder of Hwy 12.	Possible temporary displacement of wildlife during project implementation; however, wildlife use of the area should have resumed.	No anticipated cumulative effects.
Browns Gulch C&H Allotments	2000		1 acre within combo boundary. This allotment has been vacant since 2000. Located in Elkhorn Mountains.	No impact to wildlife since this project is outside of any wildlife cumulative effects boundary.	No anticipated cumulative effects.

Activity/Project Name	Decade/Year	Tenmile-South Helena Project Area	Combined Boundary (Includes Project Area)	Effects of Past Activity	Contribution of Project to Cumulative Effects
Telegraph Cr. Rd. 495 Surfacing and Drainage	2000		Road 495 recondition 8.4 miles; 12 inches grid rolled aggregate for 2.25 miles; 4 inches surface aggregate for .48 miles; construct 9 drain dips.	Possible temporary displacement of wildlife during project implementation; however, wildlife use of the area should have resumed. Also, the location along an open road system dilutes its impact for most species.	There are no anticipated cumulative effects associated with Alternative 1. The action alternatives may result in temporary displacement of local wildlife which would add to the displacement effects associated with this past project.
Commercial road use permits	1994-2000	These permits were issued for short term commercial use of Forest Service Roads. [D&G Lumber (2000), Minnehaha Creek (1997), Bullion Parks/Telegraph Creek (1994), Stowe (1994),		Possible temporary displacement of wildlife during project implementation; however, wildlife use of the area should have resumed.	There are no anticipated cumulative effects associated with alternative 1. The action alternatives may result in temporary displacement of local wildlife which would add to the displacement effects associated with this past project.
Continental Divide Trail Reconstruction Phase 1	1999	Phase I entailed the construction/reconstruction on several non-motorized segments of CDNST #337 near MacDonald Pass, Mullan Pass to Priest Pass, and Black Mountain.		New trail construction on the Helena NF (1) substitutes new foot trail for routes that formerly followed roads (open and closed) or (2) moves existing trail out of problematic locations (stream bottoms, wet meadows, etc.). Given the relatively low-key use, effects are usually beneficial or neutral for wildlife except during project implementation.	There are no anticipated cumulative effects associated with alternative 1. The action alternatives may result in temporary displacement of local wildlife which would add to the displacement effects associated with this past project.
EA Continental Divide Scenic Trail on Federal Lands	1999	There are no anticipated cumulative effects associated with alternative 1. The action alternatives may result in temporary displacement of local wildlife which would add to the displacement effects associated with this past project.		Effects to wildlife as associated with trail construction/reconstruction.	There are no anticipated cumulative effects.

Activity/Project Name	Decade/Year	Tenmile-South Helena Project Area	Combined Boundary (Includes Project Area)	Effects of Past Activity	Contribution of Project to Cumulative Effects
Monarch Creek Trail Reconstruction	June 1998		Construction/reconstruction of the non-motorized Monarch Creek Trail #362 in the Electric Peak Roadless Area. Work includes installation of 65 water-bars, 3 wooden stock bridges, and 3 French Drains; reconstruction of 5 switchbacks; construction of a turnpike approximately 25 meters long, obliterate approximately 727 meters of abandoned trail and grub approximately 560 meters of existing trail.	Possible temporary displacement of wildlife during project implementation; however, wildlife use of the area should have resumed.	There are no anticipated cumulative effects associated with Alternative 1. The action alternatives may result in temporary displacement of local wildlife which would add to the displacement effects associated with this past project.
Frontier Town Monument, Sign, and Powerline	1998		Re-issuance of a Special Use Permit to Erik Little, the new owner of Frontier Town for the private-owned monument, sign, and power line on 0.22 acres of NFS lands.	Possible temporary displacement initially; however, wildlife in the area most likely have adjusted their use patterns.	No anticipated cumulative effects.
Recreational Special Use Permit	1998-2002		These permits are issued for short term use on public lands for recreational activities/gatherings. MT DOC (1998), Elliston VFD (1998), CTVA (2002)	Possible temporary displacement of wildlife during project implementation; however, wildlife use of the area should have resumed. Also, the location along an open road system dilutes its impact for most species.	No anticipated cumulative effects; wildlife have had a chance to re-adjust their use patterns.

Activity/Project Name	Decade/Year	Tenmile-South Helena Project Area	Combined Boundary (Includes Project Area)	Effects of Past Activity	Contribution of Project to Cumulative Effects
Treasure Mountain Snowmobile Trail Relocation	November 1997	This decision approved relocating segments of the groomed snowmobile trail in the Treasure Mountain area. Segments included Little Blackfoot River Road, FSR 1857-A1, FSR 1857, FSR 1857-D1, FSR 1859 to the Telegraph Creek Road. Another section starts on FSR 1857 at the junction with FSR 1857-B1 and proceeds on FSR 157-B1 to Ontario Creek Road 123.		No impacts to wildlife associated with the re-routing.	There are no anticipated cumulative effects
Cellular Telephone Authorization; MacDonald Pass Site	1994		Authorized the use of NFS lands to install, operate and maintain a commercial cellular telephone facility on the MacDonald Pass Electronics Site.	Possible temporary displacement of wildlife during project implementation; however, wildlife use of the area should have resumed.	There are no anticipated cumulative effects
Amateur Radio Authorization; MacDonald Pass Electronics Site	1994		Authorized the use of NFS lands to install, operate, and maintain an amateur radio system to co-locate within the U.S. Government facility at the MacDonald Pass Electronics Site.	No impacts to wildlife.	No anticipated cumulative effects.

Activity/Project Name	Decade/Year	Tenmile-South Helena Project Area	Combined Boundary (Includes Project Area)	Effects of Past Activity	Contribution of Project to Cumulative Effects
Minnehaha Trail Project	September 1991	Decision authorized the development of a trail route between the Moose Creek work center and Forest Road 527 using an old abandoned railroad bed. Activities included construction of a bridge, installing a culvert, pruned trees and shrubs, removed rocks, and relocated power poles off the railroad bed.		The new trail followed an existing route in an area with relatively high levels of human activity. It has not introduced new disturbance. Effects to wildlife were minimal.	There are no anticipated cumulative effects.
Ten-Mile Creek Gravel Source Drilling	1991	Authorized construction of approximately 580 feet of private road across NFS lands for short-term access to a gravel source. Up to 5 core sample test holes were implemented with the road obliterated and re-vegetated after completion of the sampling.		Possible temporary displacement of wildlife during project implementation; however, wildlife use of the area should have resumed.	There are no anticipated cumulative effects.
John T. and Merrylee McCrea small Tracts Case	1991	The Forest Service sold 2.8 acres that contained three tracts of mineral fractions virtually surrounded by patented mining claims to John T and Marylee McCrea in order to improve management and adjust property boundaries.		Possible temporary displacement initially; however, wildlife in the area most likely have adjusted their use patterns.	There are no anticipated cumulative effects.

Activity/Project Name	Decade/Year	Tenmile-South Helena Project Area	Combined Boundary (Includes Project Area)	Effects of Past Activity	Contribution of Project to Cumulative Effects
U.S. West Buried Phone Line	1991	This decision authorized installation of a buried phone line across NFS lands within the ROW of FSR #137 under a special-use permit.		Possible temporary displacement of wildlife during project implementation; however, wildlife use of the area should have resumed.	There are no anticipated cumulative effects.
MacDonald Pass Cattle and Horse Allotment	November 1990	This was an approved updated allotment management plan for the MacDonald Pass C&H allotment. This involved the implementation of a three pasture deferred rotation system and construction of approximately 0.5 miles of barbed wire fence.		This retained the basic pattern of competition for forage on summer range between cattle and native grazers, but continued the trend of reducing competition in key areas and improving range condition with each AMP revision.	Alternative 1 could contribute cumulative effects due to forage conditions that are expected to improve in forested understories as a result of mountain pine beetle related mortality. The action alternatives could also contribute cumulatively as a result of treatments in dead and dying stands that will open up those stands thereby improving forage.
Issuance for Mining Plan of Operations	1989-1992	Pegasus Drill Project and Mining Plans of Operation for Clemmer Gulch & O'Keefe Mountain (1992): 2 acres surface disturbance for 60x60 foot drill pads and temporary road construction; Phelps Dodge Karger II (1990): exploratory drilling with reclamation work; Phelps Dodge Mining Co. (1989): exploratory drilling and trenching temporary drill pads and temporary roads built with reclamation work		Disruption of wildlife movement and habitat use during the life of the project; wildlife use of the area should have resumed.	There are no anticipated cumulative effects.

Activity/Project Name	Decade/Year	Tenmile-South Helena Project Area	Combined Boundary (Includes Project Area)	Effects of Past Activity	Contribution of Project to Cumulative Effects
Clancy Cattle & Horse Allotment Revision	1988		Decision approved implementation of a modified rest rotation grazing system for the Clancy allotment. This was agreed to with the grazing permittee at that time with some stipulations. Some changes included moving two cattleguards, installing three new cattleguards, relocating or installing seven miles of fence, reconstructing two miles of boundary fence & removal of one mile of fence.	This retained the basic pattern of competition for forage on summer range between cattle and native grazers, but continued the trend of reducing competition in key areas and improving range condition with each AMP revision.	There are no anticipated cumulative effects associated with this decision any longer. See updated Clancy Unionville AMP information above.
Chessman Reservoir Complex-Repair and Management	1988	Issued the City of Helena a permit authorizing the Chessman Reservoir and dam rehabilitation work subject to mitigation along with associated facilities.		Possible temporary displacement of wildlife during project implementation; however, wildlife have adjusted use patterns by now.	There are no anticipated cumulative effects.
Chessman Minerals Pit Sites	1987	Determined that this pit site is ideal to be used for repair and maintenance of existing forest roads.		Disruption of wildlife movement and habitat use during the life of the project; wildlife use of the area should have resumed.	There are no anticipated cumulative effects.

Table 268. Present and ongoing activities. (E-3)

Activity/Project Name	Decade/Year	Tenmile-South Helena Project Area	Combined Boundary (Includes Project Area)	Effects of Ongoing Activity	Contribution of Project to Cumulative Effects
Red Mountain Flume/Chessman Reservoir Project	Ongoing	Currently implementing a fuel reduction project around Chessman Reservoir and the associated water flume infrastructure. Treatments are designed to reduce hazardous fuels around existing infrastructure. Approximately 500 total acres of		The Red Mountain Flume/Chessman Reservoir Project is primarily removing dead trees – snags – along the Chessman Reservoir and Flume; however, Forest Plan standards for	Alternative 1 would contribute to the effects of the Red Mountain Flume project because forested stands that are killed by mountain pine beetles would revert to early seral stages

Activity/Project Name	Decade/Year	Tenmile-South Helena Project Area	Combined Boundary (Includes Project Area)	Effects of Ongoing Activity	Contribution of Project to Cumulative Effects
		fuels treatments and harvest are expected.		<p>snags are being met.</p> <p>The project treats approximately 332 acres in the area around Chessman Reservoir that currently serves as the main movement corridor through the project area. All dead trees and the bulk of the woody debris would be removed from a broad swath around the reservoir and around some of the large meadow to the south, leaving open-grown forest of widely varying density, (depending on the distribution of green trees that have survived the beetles. The forest would be allowed to regenerate but would be managed for relatively wide spacing of overstory trees and no effective ladder fuels.</p> <p>The loss of cover in riparian areas associated with the project may be disruptive to small mammals dependent on riparian areas. Boreal toads may be affected via effects to upland habitats which would result in a reduction of future woody debris accumulation. Logs and other debris provide some of the cover adult toads use when moving through upland areas in summer. Immediate post-project environments would be similar in treated and untreated sites. But over the next 15 years, treated sites would accumulate much less deadfall than untreated areas—exposing toads to slightly more risk when ranging away from riparian areas.</p> <p>Approximately 4 acres of hiding cover are treated in the Jericho herd unit; 87 acres in the Black Mountain-Brooklyn Bridge EHU; and 343 acres</p>	<p>similar to those early seral stands that were created as a result of regeneration harvest in the Red Mountain Flume project area.</p> <p>Alternative 2 would result in the removal of 7,254 acres of Forest Plan hiding cover in the Jericho herd unit; 10,706 in Black Mountain-Brooklyn Bridge EHU; and 1,434 in Quartz Creek EHU. Alternative 3 would result in the removal of 4,024 acres of Forest Plan hiding cover in the Jericho herd unit; 8,500 in Black Mountain –Brooklyn Bridge; and 788 in Quartz Creek EHU. Both alternatives would add cumulatively to the effects associated with the Red Mountain Flume project. Note that acres treated and reduction in Forest Plan hiding cover are not equal. In order to be considered Forest Plan hiding cover, a stand must be at least 40 acres in size of hiding cover.</p> <p>Alternative 2 would treat 4,529 acres in LAU di-05. Alternative 3 would treat 3,011 acres. Regeneration harvest comprises 41% and 47% of treatments in Alternatives 2 and 3 respectively in di-05. Alternative 2 would treat 722 acres in LAU di-06. Alternative 3 would treat 182 acres. Regeneration harvest comprises 47% and 0% of treatments in Alternatives 2 and 3 respectively in di-06. The action alternatives would add to the effects of the Red Mountain Flume/Chessman Reservoir project by creating additional acres of early stand initiation habitat.</p>

Activity/Project Name	Decade/Year	Tenmile-South Helena Project Area	Combined Boundary (Includes Project Area)	Effects of Ongoing Activity	Contribution of Project to Cumulative Effects
				<p>in the Quartz Creek EHU. Twenty two acres of lynx multistory hare habitat are treated in di-05 which overlaps with the Tenmile-South Helena project. Twelve acres of early stand initiation are treated; and 366 of 'other' habitat which includes mid-seral and stem exclusion stands. Nine acres of lynx multistory hare habitat are treated in di-06 which overlaps with the Tenmile-South Helena project. Five acres of early stand initiation are treated; 1 acre of stand initiation hare habitat, and 22 acres of 'other' habitat which includes mid-seral and stem exclusion stands.</p>	<p>All action alternatives will result in the removal of some snags with potential impacts to snag associated species adding to the effects of the Red Mountain Flume project. However, Forest Plan standards will be met for snags.</p>
Private road special use permits	Ongoing	These permits were issued to private landowners to access their private inholdings on roads that are primarily not open to public use, some have seasonal closures; 27 permits are located within the project boundary only while the other 12 fall within the combo boundary		<p>These permits cumulatively increase the total motorized access across the Forest. Displacement of wildlife is periodic, temporary, and very local. The connected actions on the private land (human residence) are inevitably more disruptive than the fleeting human presence on the access routes.</p>	<p>There are no anticipated cumulative effects associated with Alternative 1. The action alternatives may result in temporary displacement of local wildlife which would add to the displacement effects associated with this ongoing project.</p>

Activity/Project Name	Decade/Year	Tenmile-South Helena Project Area	Combined Boundary (Includes Project Area)	Effects of Ongoing Activity	Contribution of Project to Cumulative Effects
Recreation Residence Tracts	Ongoing	Residences are authorized under a 20-year Special Use Permit. Lots are typically 1 acre or less in size. These cannot be utilized as a primary residence and can only be used less than six months in a calendar year. Five recreation residences are permitted within the Moose Creek Villa Tract that falls within the project boundary. Six recreation residences are permitted within Forest Heights and fall within the combo boundary.	.	Periodic but long-term centers of human activity in otherwise suitable wildlife habitat, resulting in local species such as elk, deer, bears, bobcats, goshawks, etc. altering habitat use patterns to accommodate the residences. Those at Forest Heights (just to the north of Highway 12) are the most problematic as they lie in an area frequently used by wide-ranging species moving along the Continental Divide	There are no anticipated cumulative effects associated with alternative 1. The action alternatives may result in temporary displacement of local wildlife which would add to the displacement effects associated with this ongoing project.

Activity/Project Name	Decade/Year	Tenmile-South Helena Project Area	Combined Boundary (Includes Project Area)	Effects of Ongoing Activity	Contribution of Project to Cumulative Effects
3 Campgrounds 1 Day Use Areas 1 Rental Cabins 8 Trailheads	Ongoing		<p>Campgrounds are open seasonally from May through October and include: Moose Creek, Cromwell Dixon and Park Lake.</p> <p>Day use areas: Tenmile Picnic Site.</p> <p>Rental Cabin: Moose Creek</p> <p>Trailheads in project boundary: MacPass CDNST, Park City, Helena Ridge Trail, Lazyman, Moose Creek, and Lava Mtn., Trailheads in Combo boundary: Monarch and Joe Bowers</p>	<p>Effects are variable, depending on the type of facility and its location. All represent focal points of human activity that tend to deter wildlife species averse to human presence. Most are active primarily from late spring through mid-fall.</p> <p>Campgrounds are most disruptive because of their size and regular use. The Moose Creek cabin is adjacent to a busy County road and adds little to that existing condition. Use of trailheads is generally low-key and sporadic.</p>	<p>There are no anticipated cumulative effects associated with Alternative 1. The action alternatives may result in temporary displacement of local wildlife which would add to the displacement effects associated with this ongoing project.</p>
Routine Use and Maintenance of Non-motorized Forest Trails for Summer Use	Ongoing	<p>There are some non-motorized trails in the Ten Mile Drainage including the Switchback Ridge Trail.</p> <p>Other areas: Continental Divide National Scenic Trail and Monarch.</p> <p>These trails receive routine maintenance and clearing of debris annually</p>	<p>Trail work generates temporary displacement of wary wildlife species from around the moving work sites. Disruption is of short duration and low intensity. Impacts are minor. Trail use facilitated by the maintenance is low-key and sporadic.</p>	<p>There are no anticipated cumulative effects associated with Alternative 1. The action alternatives may result in temporary displacement of local wildlife which would add to the displacement effects associated with this ongoing project.</p>	

Activity/Project Name	Decade/Year	Tenmile-South Helena Project Area	Combined Boundary (Includes Project Area)	Effects of Ongoing Activity	Contribution of Project to Cumulative Effects
HMO closures on the Helena Ranger District	On-going	Access controls or the permanent closure of mine opening on the Helena Ranger district to ensure public safety. Closures will take place at multiple locations across the Helena Ranger District. More expected closures in 2015 and beyond.	Temporary local displacement of wildlife from the immediate site—minor impact. Retention of habitat opportunity for bats.	There are no anticipated cumulative effects associated with Alternative 1. The action alternatives may result in temporary displacement of local wildlife which would add to the displacement effects associated with this ongoing project.	

Activity/Project Name	Decade/Year	Tenmile-South Helena Project Area	Combined Boundary (Includes Project Area)	Effects of Ongoing Activity	Contribution of Project to Cumulative Effects
Routine Use and Maintenance of Forest trails and areas for over-snow winter use	Ongoing	<p>The Macdonald Pass cross country ski trails are used throughout the winter and are regularly groomed by the Last Chance Nordic Ski Club. The formerly Quigley Group Use Area below the pass is sometimes used by cross-country skiers.</p> <p>The former Moose Creek Group Use Area is utilized as a snowmobile trailhead accessing a trail system that connects to Bullion Parks over to Jericho Mountain and down along the Hahn Creek Road tying into the Little Blackfoot Road and Kading Cabin /Limburger Springs areas. There is also a snowmobile trailhead located off of the Little Blackfoot Road near the Lions Sunshine Camp. Please refer to the Divide Travel Plan alternative maps for specific trail locations and areas open to over-snow use.</p>	<p>The MacDonald Pass ski sites (including Quigley Group Use Area and just to the north of Highway 12) are in an area of relatively high year-round human activity. Use is confined to predictable routes: some wildlife species detour around, others take advantage of the packed trails, some range through only at night, and others keep on with business as usual.</p> <p>The Moose Creek trailhead is a compact area in a road corridor with relatively high traffic levels. The trail system radiating out from the trailhead, however, is dispersed and extensive.</p>	<p>There are no anticipated cumulative effects associated with Alternative 1. The action alternatives may result in temporary displacement of local wildlife which would add to the displacement effects associated with this ongoing project.</p>	
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Activity/Project Name	Decade/Year	Tenmile-South Helena Project Area	Combined Boundary (Includes Project Area)	Effects of Ongoing Activity	Contribution of Project to Cumulative Effects
MacDonald Vista Point	Ongoing	This vista point is located to the south of MacDonald Pass and is a popular observation site. It accesses the Continental Divide National Scenic Trail. During the winter months, this area has been utilized for non-motorized environmental education programs.	This project adds to the relatively concentrated human activity and development in the vicinity of MacDonald Pass—which lies near the center of a travel corridor/linkage zone for a number of wide-ranging species.	There are no anticipated cumulative effects associated with Alternative 1. The action alternatives may result in temporary displacement of local wildlife which would add to the displacement effects associated with this ongoing project.	
Electronic Sites south of Hwy 12 on MacDonald Pass	Ongoing	The south site retains 1 authorized airport beacon near the Vista Point overlook.	Adds to the relatively concentrated human activity and development in the vicinity south of MacDonald Pass—which lies near the center of a travel corridor/linkage zone for a number of wide-ranging species.	There are no anticipated cumulative effects associated with Alternative 1. The action alternatives may result in temporary displacement of local wildlife which would add to the displacement effects associated with this ongoing project.	
Special use permits for trail runs and rides	Ongoing	5 special use permits are issued to various groups for 3 trail runs and 2 mountain bike rides.	Effects are variable depending on the duration and amount of use. Activities have potential to disrupt wildlife while ongoing. Once the activities are completed, wildlife should resume use of the area.		

Activity/Project Name	Decade/Y ear	Tenmile-South Helena Project Area	Combined Boundary (Includes Project Area)	Effects of Ongoing Activity	Contribution of Project to Cumulative Effects
Routine Use and Maintenance of Open Forest Roads	Ongoing	Routine maintenance not necessarily annually includes blading, brushing, culvert cleanout, etc. Use of Forest Roads varies by route and season.	A series of temporary local displacement episodes for local wildlife species. Its location along open road system dilutes its impact for most species: minor impact.	There are no anticipated cumulative effects associated with Alternative 1. The action alternatives may result in temporary displacement of local wildlife which would add to the displacement effects associated with this ongoing project.	
Power Utilities, Phone Utilities, Yellowstone Gas Pipeline, & Touch America Fiber Optic Lines	Ongoing	Utility lines are authorized under the terms of a special use permit. The gas and fiber optic line are co-located. Routine maintenance are accepted and understood under the terms of the permit. 41 permits are located within the project and combo boundaries.	Temporary, low-profile disturbance of local wildlife. Minimal impact.	There are no anticipated cumulative effects associated with Alternative 1. The action alternatives may result in temporary displacement of local wildlife which would add to the displacement effects associated with this ongoing project.	
DOT Right of Way	Ongoing	7 Department of Transportation easements are located in the project and combo boundaries.	Temporary, low-profile disturbance of local wildlife. Minimal impact.	There are no anticipated cumulative effects associated with Alternative 1. The action alternatives may result in temporary displacement of local wildlife which would add to the displacement effects associated with this ongoing project.	
Prickly Pear Sportsman's Association Shooting Range	Ongoing		The Prickly Pear Sportsman's Association recreational shooting range operates under a special use permit on the North side of Highway 12 on MacDonald Pass.	This project adds to the relatively concentrated human activity and development in the vicinity of MacDonald Pass—which lies near the center of a travel corridor/linkage zone for a number of wide-ranging species.	There are no anticipated cumulative effects associated with Alternative 1. The action alternatives may result in temporary displacement of local wildlife which would add to the displacement effects associated with this ongoing project.

Activity/Project Name	Decade/Year	Tenmile-South Helena Project Area	Combined Boundary (Includes Project Area)	Effects of Ongoing Activity	Contribution of Project to Cumulative Effects
Livestock and Cultivation Special Use permits	Ongoing		4 livestock area and 2 cultivation permits are issued in the Elkhorn Mountains which reside in the combo boundary.	This project is outside of the wildlife cumulative effects boundaries.	There are no anticipated cumulative effects.
Fence/Ag residence permits	Ongoing		1 permit for a fence and 1 permit for agricultural residence are located in the combo boundary.	Initial displacement of wildlife; however, wildlife should have adjusted use patterns by now.	There are no anticipated cumulative effects.
Encroachment permit	Ongoing	Special use permit issued for structure encroachment onto FS lands. Located in project area.		Initial displacement of wildlife; however, wildlife should have adjusted use patterns by now.	There are no anticipated cumulative effects.
Highway Maintenance Station under a special use permit	Ongoing		This is under a special use permit issued to the Montana State Department Commission. The station is located on the upper east side of MacDonald Pass on the west side of US Highway 12.	This project adds to the relatively concentrated human activity and development in the vicinity of MacDonald Pass—which lies near the center of a travel corridor/linkage zone for a number of wide-ranging species. Although, wildlife should have adjusted use patterns by now to account for this structure.	There are no anticipated cumulative effects associated with Alternative 1. The action alternatives may result in temporary displacement of local wildlife which would add to the displacement effects associated with this ongoing project.
Water transmission permits	Ongoing	7 special use permits issued for multiple water transmission activities. Issued to both private residents and City of Helena. All are located in project boundary.		Initial displacement of wildlife; however, wildlife should have adjusted use patterns by now.	There are no anticipated cumulative effects.

Activity/Project Name	Decade/Year	Tenmile-South Helena Project Area	Combined Boundary (Includes Project Area)	Effects of Ongoing Activity	Contribution of Project to Cumulative Effects
5 Natural Resource Conservation Service Snotel Sites under a special use permit	Ongoing	The NRCS maintains five sites for monitoring snow depth and water content under a special use permit. 4 sites are located in the project area while 1 site is located in the combo boundary.	No measureable effects to wildlife.	There are no anticipated cumulative effects.	
Timber Harvest on Private or other non FS lands.	Ongoing	Timber harvest may occur on private lands on unspecified acres, primarily tractor logging within the planning area.	This activity more or less mimics the effects of Forest timber harvest/fuels treatment in the 2010-2014 period. Most recent harvest has been of dead trees: thus reducing short-term hiding cover, but having little effect on snowshoe hare habitat or goshawk nesting habitat. Snag numbers decrease locally.	Alternative 1 would contribute to the effects of past timber because forested stands that are killed by mountain pine beetles would revert to early seral stages similar to those early seral stands that were created as a result of regeneration harvest from the 1980s through today. The action alternatives may result in temporary displacement of local wildlife which would add to the displacement effects associated with this past project. The action alternatives would also removing short term hiding cover, lynx habitat, and goshawk nesting habitat.	

Activity/Project Name	Decade/Year	Tenmile-South Helena Project Area	Combined Boundary (Includes Project Area)	Effects of Ongoing Activity	Contribution of Project to Cumulative Effects
Noxious Weed Treatment on National Forest Lands	Ongoing	Herbicide treatment is primarily along roads and in patches that are accessible to mechanized equipment (spraying with ATVs) and/or by hand, biological (insects), goats/sheep, and aerial spraying. Treatment areas are identified in the EIS/ROD and are continually updated and treated as new infestations are located.	Over the long term, these operations gradually improve the quality of foraging habitat for native species. Temporary displacement of some local species during active spraying operations.	There are no anticipated cumulative effects associated with Alternative 1. The action alternatives may result in temporary displacement of local wildlife which would add to the displacement effects associated with this ongoing project.	
Grazing Activities on Private Lands	Ongoing	Grazing of cattle, sheep and horses on private lands within the Telegraph Project and Combo boundary. This may result in impacts to riparian vegetation, stream banks, and upland vegetation. There will also be results to vegetation management, forage production, and economic well-being.	This activity adds to the competition for forage on summer range between domestic livestock and native grazers (esp. elk and mule deer)—but not to the point that summer range conditions are limiting for native species.	There are no cumulative impacts associated with Alternative 1. The action alternatives include prescribed fire treatments that will impact grass and shrublands in the short term while enhancing these communities in the long term. There may be some short term cumulative impacts associated with the prescribed burning relative to grazing activities.	

Activity/Project Name	Decade/Y ear	Tenmile-South Helena Project Area	Combined Boundary (Includes Project Area)	Effects of Ongoing Activity	Contribution of Project to Cumulative Effects
MacDonald Pass Grazing Allotment	Ongoing	4,573 acres within the combo boundary, 2,518 acres within the project boundary. 104 cow/calf pair; 115 permitted use days; start of permit in late June; resides on both sides of the divide and is under a deferred grazing system.	This activity adds to the competition for forage on summer range between domestic livestock and native grazers (esp. elk and mule deer)—but not to the point that summer range conditions are limiting for native species.		There are no cumulative impacts associated with Alternative 1. The action alternatives include prescribed fire treatments that will impact grass and shrublands in the short term while enhancing these communities in the long term. There may be some short term cumulative impacts associated with the prescribed burning relative to grazing activities.
Frohner C&H Grazing Allotment	Ongoing	1,096 acres in the project area, 5,739 acres within the combo boundary; 100 permitted cow/calf pair; 92 permitted use days; start of permit in July 1; deferred grazing system. Allotment has seen little use in last 3 years because of blowdown trees destroying fences. Data collected 2009.	This activity adds to the competition for forage on summer range between domestic livestock and native grazers (esp. elk and mule deer)—but not to the point that summer range conditions are limiting for native species.		There are no cumulative impacts associated with Alternative 1. The action alternatives include prescribed fire treatments that will impact grass and shrublands in the short term while enhancing these communities in the long term. There may be some short term cumulative impacts associated with the prescribed burning relative to grazing activities.

Activity/Project Name	Decade/Year	Tenmile-South Helena Project Area	Combined Boundary (Includes Project Area)	Effects of Ongoing Activity	Contribution of Project to Cumulative Effects
Big Buffalo C&H Grazing Allotment	Ongoing	7,638 acres within project boundary, 7,642 acres within the combo boundary; 100 permitted cow/calf pair; 92 permitted use days; start of permit July 1. Data collected 2009	This activity adds to the competition for forage on summer range between domestic livestock and native grazers (esp. elk and mule deer)—but not to the point that summer range conditions are limiting for native species.	There are no cumulative impacts associated with Alternative 1. The action alternatives include prescribed fire treatments that will impact grass and shrublands in the short term while enhancing these communities in the long term. There may be some short term cumulative impacts associated with the prescribed burning relative to grazing activities.	
Little Buffalo C&H Grazing Allotment	Ongoing	4,260 acres within project boundary, 4,261 acres within combo boundary. 100 permitted cow/calf pair; 92 permitted use days; start of permit July 1. Rested in 2013. (Little Buffalo is in a rest year for 2014)	This activity adds to the competition for forage on summer range between domestic livestock and native grazers (esp. elk and mule deer)—but not to the point that summer range conditions are limiting for native species.	There are no cumulative impacts associated with Alternative 1. The action alternatives include prescribed fire treatments that will impact grass and shrublands in the short term while enhancing these communities in the long term. There may be some short term cumulative impacts associated with the prescribed burning relative to grazing activities.	
Austin C&H Grazing Allotment	Ongoing		1,720 acres within combo boundary; 24 permitted cow/calf pairs on FS. 30 permitted use days from 6/1-6/30.	This activity adds to the competition for forage on summer range between domestic livestock and native grazers (esp. elk and mule deer)—but not to the point that summer range conditions are limiting for native species.	There are no cumulative impacts associated with Alternative 1. The action alternatives include prescribed fire treatments that will impact grass and shrublands in the short term while enhancing these communities in the long term. There may be some short term cumulative impacts associated with the prescribed burning relative to grazing activities.

Activity/Project Name	Decade/Year	Tenmile-South Helena Project Area	Combined Boundary (Includes Project Area)	Effects of Ongoing Activity	Contribution of Project to Cumulative Effects
Clancy C&H Grazing Allotment	Ongoing		4,289 acres within combo boundary; 100 permitted cow/calf pairs. 99 permitted use days from 6/24-9/30.	This activity adds to the competition for forage on summer range between domestic livestock and native grazers (esp. elk and mule deer)—but not to the point that summer range conditions are limiting for native species.	There are no cumulative impacts associated with Alternative 1. The action alternatives include prescribed fire treatments that will impact grass and shrublands in the short term while enhancing these communities in the long term. There may be some short term cumulative impacts associated with the prescribed burning relative to grazing activities.
Quartz Rowe C&H Grazing Allotment	Ongoing		3,880 acres within combo boundary; 29 permitted cow/calf pairs. 168 permitted use days from 6/1-11/15.	This activity adds to the competition for forage on summer range between domestic livestock and native grazers (esp. elk and mule deer)—but not to the point that summer range conditions are limiting for native species.	There are no cumulative impacts associated with Alternative 1. The action alternatives include prescribed fire treatments that will impact grass and shrublands in the short term while enhancing these communities in the long term. There may be some short term cumulative impacts associated with the prescribed burning relative to grazing activities.
Maupin C&H Grazing Allotment	Ongoing		2,766 acres within combo boundary; 65 permitted cow/calf pairs; 116 permitted use days from 6/15-10/15. Allotment is located in the northwest corner of the Elkhorn Mountains.	This project is outside the cumulative effects boundary for wildlife.	There are no anticipated cumulative effects.

Activity/Project Name	Decade/Year	Tenmile-South Helena Project Area	Combined Boundary (Includes Project Area)	Effects of Ongoing Activity	Contribution of Project to Cumulative Effects
Tenmile Priest Pass C&H Grazing Allotment	Ongoing	<p>6,366 acres within project area, 12,336 acres within the combo boundary; 200 permitted cow/calf pair; 107 permitted use days; start of permit mid June; rest rotation; resides on both sides of the divide. 2003 Contract for the Priest Pass and Black Mountain allotments, range conditions and weed inventories were completed under a contract. In 2009 proper functioning condition was reached on Mike Renig.</p> <p>A 10-year grazing permit was issued to the RV Ranch Ranch for the grazing of domestic livestock on the Hat Creek C&H Allotment in Powell and Lewis & Clark Counties, Montana on the Helena Ranger District.</p>	<p>This activity adds to the competition for forage on summer range between domestic livestock and native grazers (esp. elk and mule deer)—but not to the point that summer range conditions are limiting for native species.</p>	<p>There are no cumulative impacts associated with Alternative 1. The action alternatives include prescribed fire treatments that will impact grass and shrublands in the short term while enhancing these communities in the long term. There may be some short term cumulative impacts associated with the prescribed burning relative to grazing activities.</p>	

Activity/Project Name	Decade/Year	Tenmile-South Helena Project Area	Combined Boundary (Includes Project Area)	Effects of Ongoing Activity	Contribution of Project to Cumulative Effects
Basin/Boulder Chief/Cataract C&H Grazing Allotment	Ongoing		2,931 acres within combo boundary. Located on the Beaverhead-Deerlodge NF. 487 permitted cow/calf pairs, 61 permitted use days from 7/16-9/15. In 2014-328 permitted cow/calf pairs grazed 92 days from 7/1-9/30.	This project is outside the cumulative effects boundary for wildlife.	There are no anticipated cumulative effects.
10-Mile EPA Reclamation	Ongoing	Reclamation/removal of approximately 40 to 50,000 cubic yards of soil from a road, residence, and the old Basin Creek Mine at the town of Rimini. Reclaimed sites will be re-vegetated. This project is on-going.		This adds to the other human activity in the vicinity of the Continental Divide which is used as a travel corridor/linkage zone for a number of wide-ranging species. This would result in temporary displacement of wildlife using this corridor.	There are no anticipated cumulative effects associated with Alternative 1. The action alternatives may result in temporary displacement of local wildlife which would add to the displacement effects associated with this ongoing project.
Monarch Mineral Sampling	Ongoing		Notice of Intent for mineral sampling and exploration activities to collect samples for testing from unprocessed mine material piles. Located in T8N, R6W, section 31.	This adds to the other human activity in the vicinity of the Continental Divide which is used as a travel corridor/linkage zone for a number of wide-ranging species. This would result in temporary displacement of wildlife using this corridor.	There are no anticipated cumulative effects associated with Alternative 1. The action alternatives may result in temporary displacement of local wildlife which would add to the displacement effects associated with this ongoing project.
Silver Crescent Mine	Ongoing		Banner Creek Drainage. T8N, R5W, Sections 21, 22, 28. Currently dormant activity. Forest Service is holding bond.	This adds to the other human activity in the vicinity of the Continental Divide which is used as a travel corridor/linkage zone for a number of wide-ranging species. While dormant, no anticipated effects to wildlife.	There are no anticipated cumulative effects.

Activity/Project Name	Decade/Year	Tenmile-South Helena Project Area	Combined Boundary (Includes Project Area)	Effects of Ongoing Activity	Contribution of Project to Cumulative Effects
Clancy Unionville Vegetation Manipulation and Travel Management Project	Ongoing	Travel management, Forest vegetation improvements, Fuel treatments (non-activity fuels), Watershed improvements, Road improvements/construction, Road maintenance, Road decommissioning. Harvest activities have been completed, fuels treatments are ongoing.	Temporary displacement to wildlife while activities are ongoing. Prescribed fire should ultimately improve forage conditions in the understory.	There are no anticipated cumulative effects associated with Alternative 1. The action alternatives may result in temporary displacement of local wildlife which would add to the displacement effects associated with this ongoing project. The action alternatives would also add to the prescribed fire effects.	
Chessman Reservoir Complex & Waterlines/Ditches	Ongoing	The City of Helena was issued a special use permit to maintain the Chessman Reservoir and associated waterlines/ditches for providing potable water to the City of Helena. This reservoir and water system is located in the Red Mountain Area.		Temporary displacement to wildlife during periods of activity.	There are no anticipated cumulative effects associated with Alternative 1. The action alternatives may result in temporary displacement of local wildlife which would add to the displacement effects associated with this ongoing project.

Activity/Project Name	Decade/Year	Tenmile-South Helena Project Area	Combined Boundary (Includes Project Area)	Effects of Ongoing Activity	Contribution of Project to Cumulative Effects
University of Montana-Helena Outfitter/Guide Permit	Ongoing	Permit issued for a variety of guided recreational activities in numerous locations on the Helena ranger district.	Temporary displacement to wildlife during periods of activity.	There are no anticipated cumulative effects associated with Alternative 1. The action alternatives may result in temporary displacement of local wildlife which would add to the displacement effects associated with this ongoing project.	
Northwestern Energy Powerline	Ongoing	Hazard tree removal along powerline corridor in Tenmile drainage and MacDonald pass.		Loss of snags along powerline corridors; coarse woody debris is generally left in place. One of several projects removing hiding cover & standing dead tree habitat 5-10 years before these components would have been lost by natural attrition.	Alternative 1 would contribute to the effects of past timber because forested stands that are killed by mountain pine beetles would revert to early seral stages similar to those early seral stands that were created through powerline maintenance. The action alternatives may result in temporary displacement of local wildlife which would add to the displacement effects associated with this past project. The action alternatives would also removing short term hiding cover, lynx habitat, and goshawk nesting habitat.
Travis Creek Power Line Relocation	Ongoing	Replacement of the 7.3kv overhead power line to a 7.2kv underground power line.		Potential disturbance to wildlife during project activities.	There are no anticipated cumulative effects associated with Alternative 1. The action alternatives may result in temporary displacement of local wildlife which would add to the displacement effects associated with this ongoing project.

Activity/Project Name	Decade/Year	Tenmile-South Helena Project Area	Combined Boundary (Includes Project Area)	Effects of Ongoing Activity	Contribution of Project to Cumulative Effects
MT Army Nat. Guard High Elevation Helicopter Landing/Take Offs & Water Bucket Training	Ongoing	This decision issues a special use permit to the MT Army Nat. Guard to utilize Red & Lava Mountain for these landing & take off maneuvers during the months of June & December.	Displacement and disturbance to wildlife during project activities particularly in areas that are otherwise remote.	There are no anticipated cumulative effects associated with Alternative 1. The action alternatives may result in temporary displacement of local wildlife which would add to the displacement effects associated with this ongoing project.	
BLM – Clancy area Hazardous Fuels Reduction Project	Ongoing		BLM project is designed to reduce hazardous fuels on BLM administered lands within the WUI. Project activities would occur on up to 3,300 acres of the ~11,000 acre project area.	Displacement to wildlife and effects to habitat including hiding cover. Treatments are designed to open up dry forests which in the long term would improve understory conditions – i.e. forage.	There are no anticipated cumulative effects associated with Alternative 1. The action alternatives may result in temporary displacement of local wildlife which would add to the displacement effects associated with this ongoing project. The action alternatives would also removing short term hiding cover and goshawk nesting habitat adding cumulatively to the BLM project.

Activity/Project Name	Decade/Year	Tenmile-South Helena Project Area	Combined Boundary (Includes Project Area)	Effects of Ongoing Activity	Contribution of Project to Cumulative Effects
EPA- Luttrell Repository	Ongoing	2014 & 2015: A two year work plan is being implemented so that the cost of opening Luttrell Repository and treatment of waste water resultant from opening the repository can be saved and used to further remedial actions: this approach requires consolidation of mine waste into stockpiles to be hauled to Luttrell Repository in 2015. In 2014, EPA conducted clearing & grubbing so as to establish transport roads for Off Road Waste Hauling Vehicles at the National Extension mine waste site (most accessible from the Basin Side and near the ridge) and the Bunker Hill mine group (located South of Rimini).		This adds to the other human activity in the vicinity of the Continental Divide which is used as a travel corridor/linkage zone for a number of wide-ranging species. This would result in temporary displacement of wildlife using this corridor.	There are no anticipated cumulative effects associated with Alternative 1. The action alternatives may result in temporary displacement of local wildlife which would add to the displacement effects associated with this ongoing project.
Helena Mineral Society-Crystal Mine	Ongoing	Sally Ann Creek. T8N, R6W, Section 2	Potential disturbance to bats that may inhabit the mine.	There are no anticipated cumulative effects.	

Activity/Project Name	Decade/Year	Tenmile-South Helena Project Area	Combined Boundary (Includes Project Area)	Effects of Ongoing Activity	Contribution of Project to Cumulative Effects
Personal Use Firewood and Post and Pole permits	Ongoing	Firewood gathering occurs across the forest.	Firewood cutting removes dead trees along roadsides and reduces snag availability in the short term and down woody debris in the long term.	As trees continue to die in the project area due to mountain pine beetle mortality and as they ultimately fall over, Alternative 1 will slightly add to the effects of firewood removal on standing snag habitat. The action alternatives will result in snag reductions within respective treatment units; although Forest Plan standards will be met and snags will remain abundant in the Project area, there will be some cumulative impacts in conjunction with firewood retrieval.	

Activity/ Name	Estimated Implementation	Scope of Activity	Effects of Reasonably Foreseeable Activity	Contribution of Project to Cumulative Effects
Divide Travel Planning	Estimated Implementation 2015	The HNF is proposing changes to the existing roads and trail systems on National Forest System lands in the Divide planning area. This plan will provide for a variety of motorized and non-motorized winter recreation opportunities.	Alternative 5 modified would be beneficial to key wildlife species (esp. elk, deer, black bears, grizzly bears, lynx, wolves, wolverines, goshawks, pileated woodpeckers, marten) because of proposed road closures, elimination of unauthorized motor trails, snowmobile area closures, and clarification of the authorized snowmobile route system. Open route densities would decrease, the size of elk security areas and patches of unroaded habitat in general would increase, and disruption of a number of key wildlife sites by motor vehicles would be terminated.	All alternatives would not add cumulatively to the Divide Travel Plan. Although the Divide Travel Plan is an open/closed decision, the results of that decision would be used to determine future decommissioning opportunities. The action alternatives would add cumulatively to the Divide Travel Plan relative to those roads that would be used for project activities and those that would remain open under the Divide Travel Plan.

Activity/ Name	Estimated Implementation	Scope of Activity	Effects of Reasonably Foreseeable Activity	Contribution of Project to Cumulative Effects
Ten Mile Road Improvement Project (County Route 695) also known as Rimini Road.	Foreseeable	Improve road way from the junction with Hwy 12 to the junction with the Chessman Reservoir intersection, just over 6 miles in length. Improvements would include replacement of three bridges and associated railings, bridge drainage improvements, upgrading road signs, re-alignment of road segments, and paving.	Improvement of the road would increase vehicle speeds as well as the number of vehicles venturing up the road. The result in terms of wildlife displacement would probably be similar to what it is at present; but the numbers of wildlife species, large and small, hit by vehicles on the road would increase. Increased use of this road would also translate into heavier traffic on Helena NF roads that emanate from it—namely the Beaver Creek Road and the upper Telegraph and Banner Creek Roads.	There are no anticipated cumulative effects associated with Alternative 1. The action alternatives may result in temporary displacement of local wildlife which would add to the displacement effects associated with this reasonably foreseeable project.
Golden Anchor Road	Foreseeable	Aquatic Organism Passage Legacy Road: Road 4100 construct a 60' span spill thru bridge over the existing ford on the Little Blackfoot River.	Potential disturbance to wildlife during project activities; long term benefits.	There are no anticipated cumulative effects associated with alternative 1. The action alternatives may result in temporary displacement of local wildlife which would add to the displacement effects associated with this reasonably foreseeable project.

Activity/ Name	Estimated Implementation	Scope of Activity	Effects of Reasonably Foreseeable Activity	Contribution of Project to Cumulative Effects
Telegraph Creek MPB Salvage and Precommercial Thinning	Foreseeable	Approximately 6,754 acres are proposed for treatment in the proposed action. About 1,786 acres would be pre-commercially thinned (15-40 year old stands). Primary prescription would be regeneration harvest (3,484), intermediate harvest (434) and prescribed fire (1,050). About 8.5 miles of new roads are needed.	The proposed action would result in the following effects to key wildlife in the project area: approximately 2,254 acres of hiding cover could be removed in Alternative 2 in the Jericho EHU. The Jericho EHU overlaps with the Tenmile-South Helena project. The Telegraph project could also result in the removal of up to 2,515 acres of multistory hare habitat, stand initiation, early stand initiation, stem exclusion and 'other' habitat [mid-seral, etc.] in LAU di-04 (which overlaps with the Tenmile-South Helena project). LAU di-05 overlaps with the Tenmile-South Helena project as well; however, the Telegraph project does not include any treatments in LAU di-05.	<p>Alternative 1 would contribute to the effects of the Telegraph project because forested stands that are killed by mountain pine beetles would revert to early seral stages similar to those early seral stands that would be created by treatments in the Telegraph project area.</p> <p>The action alternatives would contribute cumulatively to the Telegraph project by removing up to 7,254 acres of hiding cover in the Jericho herd unit (based on alternative 2 which is the more aggressive in terms of hiding cover removal). The action alternatives would also add cumulatively to effects lynx habitat and to the linkage corridor along the Continental Divide. Alternative 2 would treat 62 acres of lynx habitat in LAU di-04.</p>
Mineral Plan of Operation	Foreseeable	It is reasonably foreseeable that the project area will see continued interest in mineral activity, which will precipitate the submission of Plan of Operations proposals to the HNF, likely at similar activity scales and rates experienced presently.	Potential disturbance and displacement of wildlife associated with mining activities.	<p>There are no anticipated cumulative effects associated with alternative 1. The action alternatives may result in temporary displacement of local wildlife which would add to the displacement effects associated with this reasonably foreseeable project.</p>

Activity/ Name	Estimated Implementation	Scope of Activity	Effects of Reasonably Foreseeable Activity	Contribution of Project to Cumulative Effects
East Deer Lodge Valley Landscape Restoration Management Project	Foreseeable	Beaverhead-Deerlodge NF. Purpose is to achieve Forest Plan Goals including Timber management, Aquatic Improvement, Wildlife Habitat improvement. Proposed activities include timber salvage, commercial thinning, sediment reduction, fish passage, road and trail decommissioning. Project includes 2,038 acres of commercial harvest, 340 acres of commercial thinning and commercial harvest, and 162 acres of commercial thinning.	This project is outside of the cumulative effects boundary for wildlife.	There are no anticipated cumulative effects.
Rimini Substation	Foreseeable	Baxendale Fire Dept.is proposing to pour a concrete slab and construct a 3 bay fire station to store firefighting equipment and to utilize existing underground tanks for the filling of fire engines during suppression activities	This project would have no effect on wildlife.	There are no anticipated cumulative effects.

Activity/ Name	Estimated Implementation	Scope of Activity	Effects of Reasonably Foreseeable Activity	Contribution of Project to Cumulative Effects
Private Land Timber Harvest	Unknown	<p>The Project area and Combined Boundary are surrounded by several acres of private land; there are also several small inholdings within both areas. There are no known activities, currently; however, it's reasonable to conclude that some timber harvest may occur in the foreseeable future.</p>	<p>Effects can't be quantified; however, there are potential impacts to a variety of species depending on the area in question.</p>	<p>Alternative 1 will not add cumulatively to private land timber harvest except in those situations where stands killed by mountain pine beetle result in young, seral stands. This will add to any regeneration harvest carried out on private land.</p> <p>The action alternatives will result in removal of some snags although Forest Plan standards will be met and snags will remain abundant in the Project area due to the mountain pine beetle. However, the reduction in snags associated with the action alternatives will add cumulatively to private land timber harvest.</p> <p>Furthermore, the action alternatives will result in the reduction in habitat for a variety of species which will add cumulatively to private land timber harvest.</p>

Activity/ Name	Estimated Implementation	Scope of Activity	Effects of Reasonably Foreseeable Activity	Contribution of Project to Cumulative Effects
Forest Plan Amendment for Grizzly Bears	Foreseeable	The Forest Plan amendment to incorporate relevant direction from the NCDE grizzly bear draft conservation strategy is designed to integrate relevant habitat-related direction from the Northern Continental Divide Ecosystem (NCDE) Grizzly Bear Conservation Strategy (GBCS) into the forest plans for the Helena, Kootenai, Lewis and Clark and Lolo National Forests (also referred to as “amendment forests”) to have an integrated set of plan direction (referred to as plan components from this point forward) consistent across the national forests that are a part of the NCDE.	This amendment should guide design elements for future projects that would benefit grizzly bears (and potentially other wildlife) and their habitat by minimizing management related disturbances and maintaining or enhancing available habitat.	None of the alternatives are expected to add cumulatively to this amendment at this time since the amendment is programmatic in nature and there is no vegetation manipulation or road management set to occur until such time as a future project tiers to the amendment.

Appendix F, Migratory Bird Treaty Act Memorandum of Understanding Compliance Report

Table F-1 identifies the bird species listed on the BCR 10 (Bird Conservation Region) list, their habitat, and status in the project area.

Species	Habitat	Status in the Project Area
Bald Eagle	Year-round range is entire forest. During the breeding season, primarily found in forested areas along rivers and lakes. Wintering habitat may include upland sites.	Not present in the project area
<i>Haliaeetus leucocephalus</i>		
G5, S3: FS Sensitive, MT Species of Concern		
Swainson's Hawk	Summer and migration range includes entire forest. Habitat is plains/coulees/shelterbelts.	Not present in the project area
<i>Buteo swainsoni</i>		
G5, S4B: MT Species of Concern		
Ferruginous Hawk	Summer and migration range includes the entire Forest; summer range is most of the Forest with the exception of the western most portion of the Lincoln District. Habitat is mixed-grass prairie, shrubland/grassland, grassland, grass-sagebrush complex, and sagebrush steppe.	Not present in the project area
<i>Buteo regalis</i>		
G4, S3B: MT Species of Concern		
Peregrine Falcon	Year-round range includes entire forest. Nesting habitat is ledge of a vertical cliff, often with a sheltering overhang.	Not present in the project area
<i>Falco peregrinus</i>		
G4, S3: FS Sensitive, MT Species of Concern		
Upland Sandpiper	Summer range includes the Elkhorns and Big Belts, migration range is the entire Forest. Habitat is dry grasslands with low to moderate forb cover, low woody cover, moderate grass cover, moderate to high litter cover and little bare ground.	Not present in the project area
<i>Bartramia longicauda</i>		
G5, S4B		
Long-billed Curlew	Summer and migration range includes entire forest. Breeding habitat includes prairies and grassy meadows, generally near water. Nests on ground usually in flat area with short grass, often near rock or	Not present in the project area
<i>Numenius americanus</i>		

G5, S3B: MT Species of Concern	other conspicuous object.	
Yellow- billed Cuckoo	Summer and migration range includes the entire Forest. Habitat is mixed-grass prairie, shrubland/grassland, grassland, grass-sagebrush complex, and sagebrush	This species is not found on the Lewis and Clark National Forest and is not addressed.
<i>Coccyzus americanus</i>		
G5, S3B: USFWS Candidate, MT Species of Concern		
Flammulated Owl	Range includes Rocky Mountain Front. Breeding habitat is montane forest; usually open conifer forests containing pine, with some brush or saplings. The species shows a strong preference for ponderosa pine and Jeffrey pine throughout its range. They prefer mature growth with open canopy avoiding dense young stands.	Observations in project area
<i>Otus flammeolus</i>		
G4, S3B: FS Sensitive, MT Species of Concern		
Black Swift	Summer and migration range found on the western portion of the Lincoln District. This species forages over forest and open areas and nests behind or next to waterfalls and wet cliffs and occasionally in limestone caves. Nest site persistence and tenacity is almost absolute.	Not present in the project area
<i>Cypseloides niger</i>		
G4, S1B: MT Species of Concern		
Calliope Hummingbird	Summer and migration range includes entire Forest. Habitat is northwestern montane environments. Eats nectar and small insects. Nests built on old dead pinecone base so it appears to be a cone.	Observations in project area
<i>Stellula calliope</i>		
G5, S5B		
Lewis's Woodpecker	Summer and migration range includes the entire forest. Habitat is open forest and woodland; often logged or burned; primarily ponderosa pine. Distribution is closely associated with open ponderosa pine forest and is strongly associated with fire maintained old growth ponderosa pine.	Not present in the project area
<i>Melanerpes lewis</i>		
G4, S2B: MT Species of Concern		
Williamson's Sapsucker	Summer and migration range includes entire Forest. Habitat is montane coniferous forest, especially fir and lodgepole pine. Usually nests in dead or decaying pine, fir or aspen.	Observations in project area
<i>Sphyrapicus thyroides</i>		

G5, S4B		
White-headed Woodpecker	No range on Forest	Not present in the project area
<i>Picoides albolarvatus</i>		
MT accidental species		
Olive-sided Flycatcher	<p>Summer and migration range includes entire Forest. Generally breeds in the montane and boreal forests. Most often associated with post-fire habitat but may also be found in other forest openings such as clear cuts and other disturbed forested habitat. Common in spruce and aspen; uncommon in mixed-conifer, ponderosa pine, pine-oak, cedar-hemlock; rarely present in lodgepole pine or pinyon-juniper.</p>	Observations in project area
<i>Contopus cooperi</i>		
G4, S4B		
Willow Flycatcher	<p>Summer and migration range includes entire forest. This species is strongly tied to brushy areas of willow and similar shrubs. Threats include factors that destroy or degrade shrubby riparian vegetation. Habitat loss and alteration is principle cause of decline.</p>	Observations in project area
<i>Empidonax traillii</i>		
G5, S4B		
Loggerhead Shrike	<p>Migration range includes the entire Forest; summer range includes the entire Divide, Elkhorn, and Big Belts landscapes and the eastern portion of the Blackfoot landscape. Breeds in open country with scattered trees and shrubs. Nests found in sagebrush, bitterbrush, and greasewood.</p>	Not present in the project area
<i>Lanius ludovicianus</i>		
G4, S3B: MT Species of Concern		
Sage Thrasher	<p>Summer and migration range includes the entire Forest. This species is a sagebrush obligate.</p>	Not present in the project area
<i>Oreoscoptes montanus</i>		
G5, S3B: MT Species of Concern		
Brewer's Sparrow	<p>Summer and migration range includes entire forest. Habitat is sagebrush areas in central Montana. Nests are in sagebrush averaging 16" tall.</p>	Not present in the project area
<i>Spizella breweri</i>		
G5, S3B:		

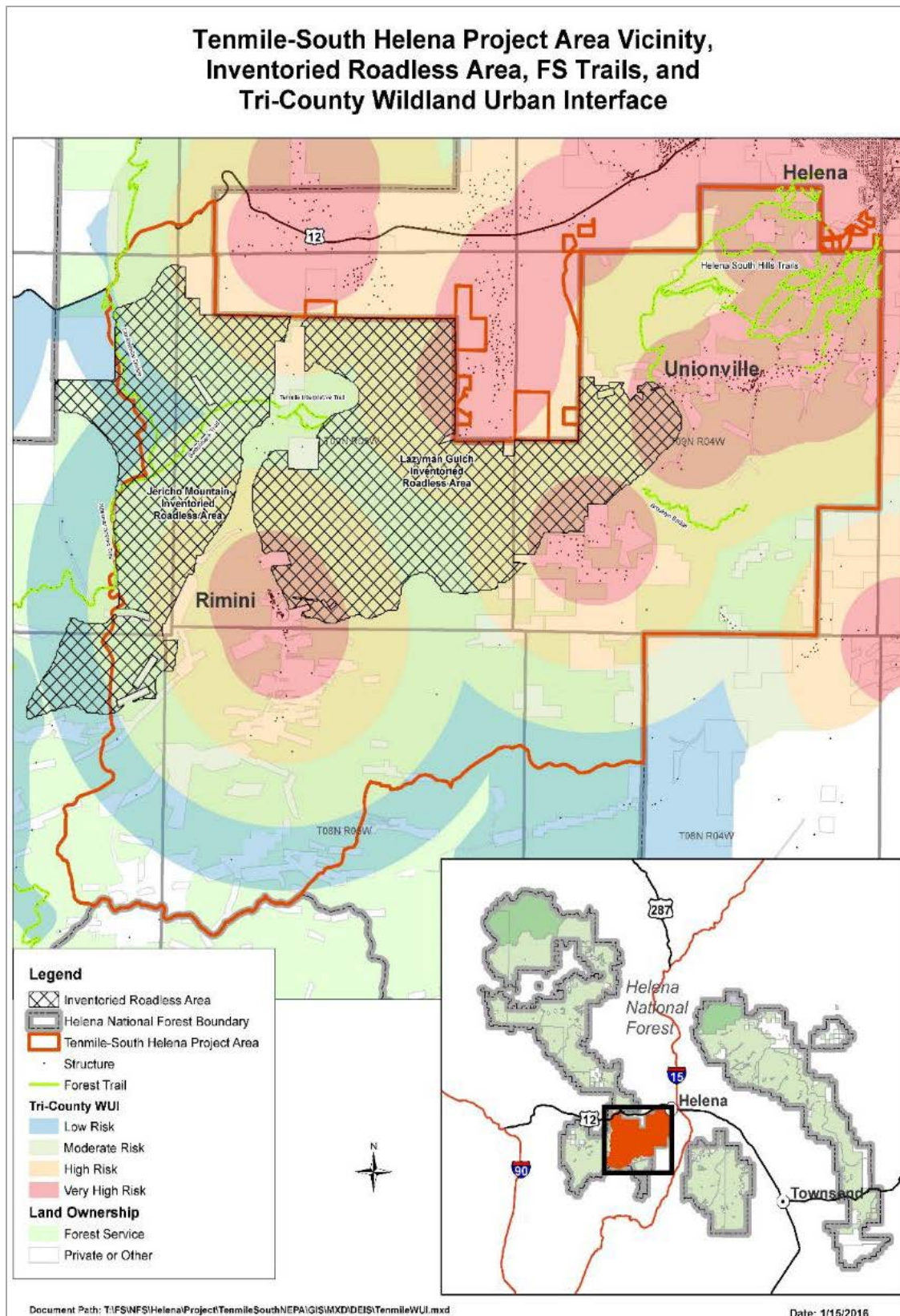
MT Species of Concern		
Sage Sparrow	Summer and migration range occurs in the southeast portion of the Elkhorns and southern Big Belts.	Not present in the project area
<i>Amphispiza belli</i>		
G5, S3B: MT Species of Concern		
McCown's Longspur	Summer and migration range primarily east of the Continental Divide. Habitat is sparse short-grass plains, plowed and stubble fields, and areas of bare or nearly bare ground.	Not present in the project area
<i>Calcarius mccownii</i>		
G4, S3B: MT Species of Concern		
Black Rosy-Finch	Summer and migration range includes southern most portion of the Divide landscape, the entire Elkhorns, and most of the Big Belts (exception is Gates of the Mountain area). Nests in crevices in cliffs and talus among glaciers and snowfields above timberline and forage in barren, rocky or grassy areas adjacent to nesting sites.	Not present in the project area
<i>Leucosticte atrata</i>		
G4, S2: MT Species of Concern		
Cassin's Finch	Year round range includes entire forest. Species prefers open coniferous forests along with mature forests of lodgepole pine.	Observations in project area
<i>Carpodacu s cassinii</i>		
G5, S3: MT Species of Concern		

APPENDIX E: MAPS

This section contains maps (listed below) for the Tenmile – South Helena Draft Environmental Impact Statement.

- Project Area Vicinity, Wildland Urban Interface, FS Trails, and Inventoried Roadless Area Map
- Alternative 2 – Proposed Action Map
- Alternative 3 Map
- Alternative 2 - Proposed Action Route Treatments and Management Area Map
- Alternative 3 Route Treatments and Management Area Map
- Cumulative Effects Analysis Map

Larger copies of the Alternative 2 – Proposed Action and Alternative 3 maps are available upon request at the Helena Ranger District: 2880 Skyway Drive, Helena, MT 59602. (406) 449-5201.



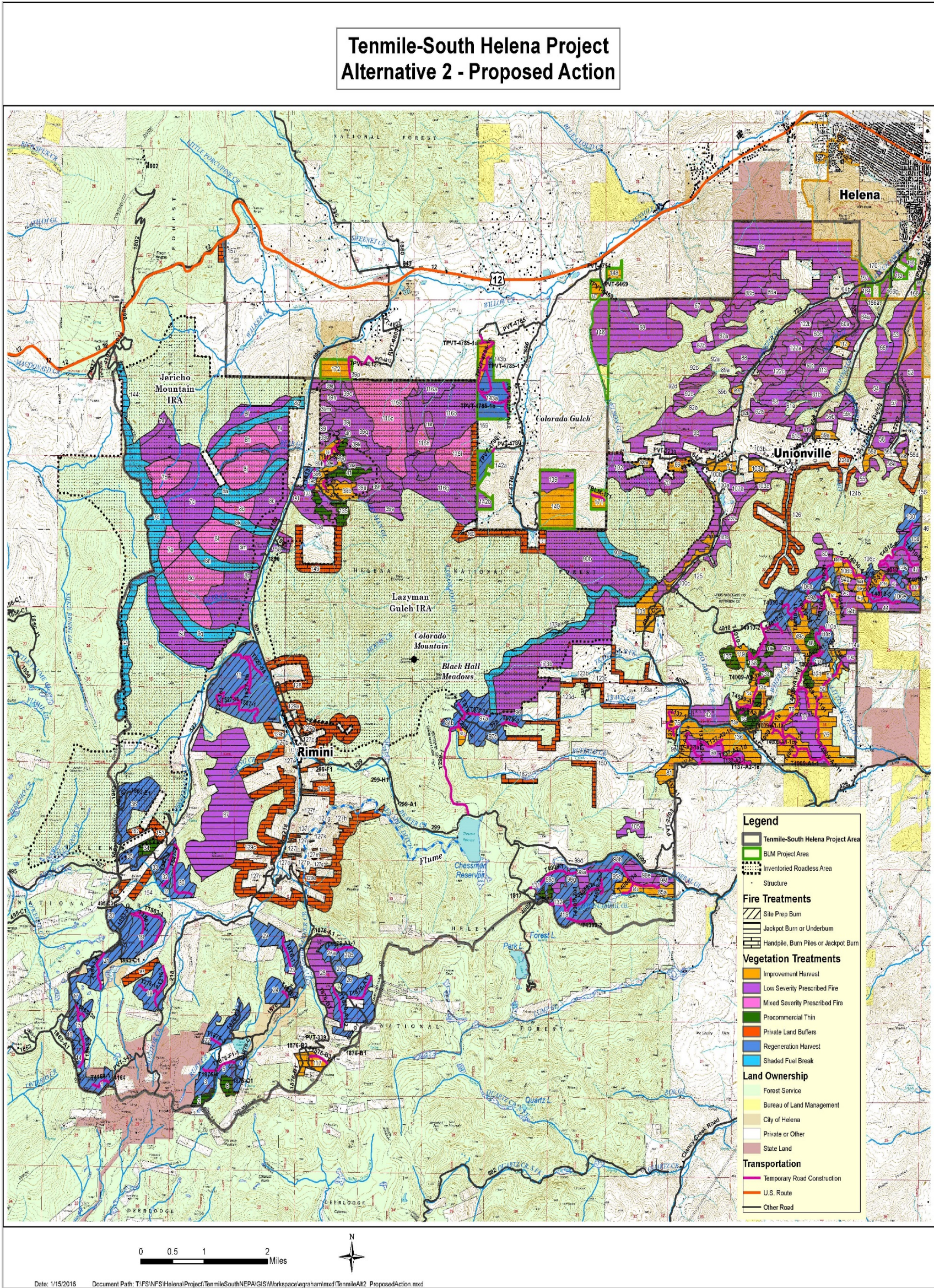


Figure 126. Alternative 2 activities

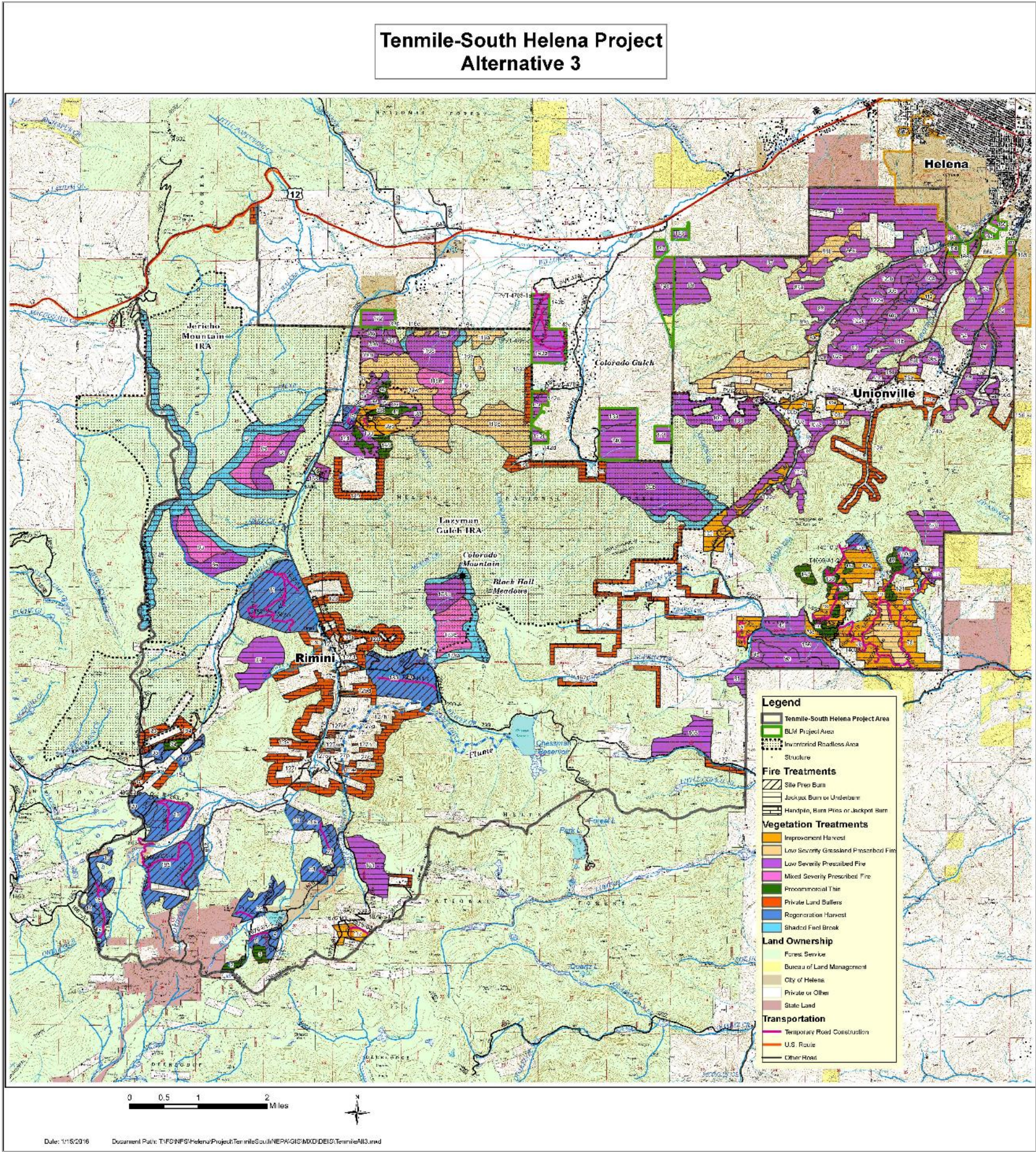


Figure 127. Alternative 3 activities.

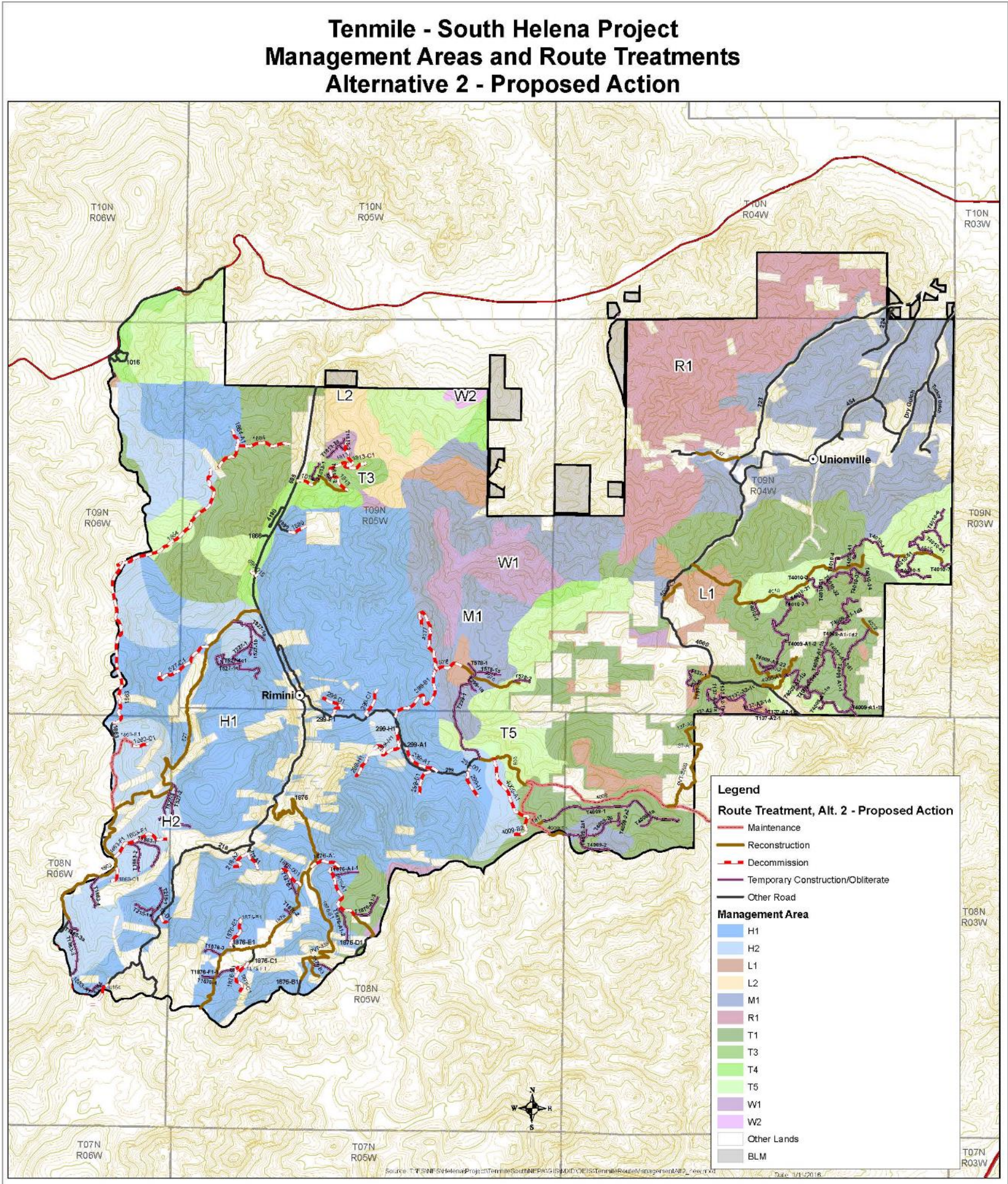


Figure 128. Alternative 2 route treatments.

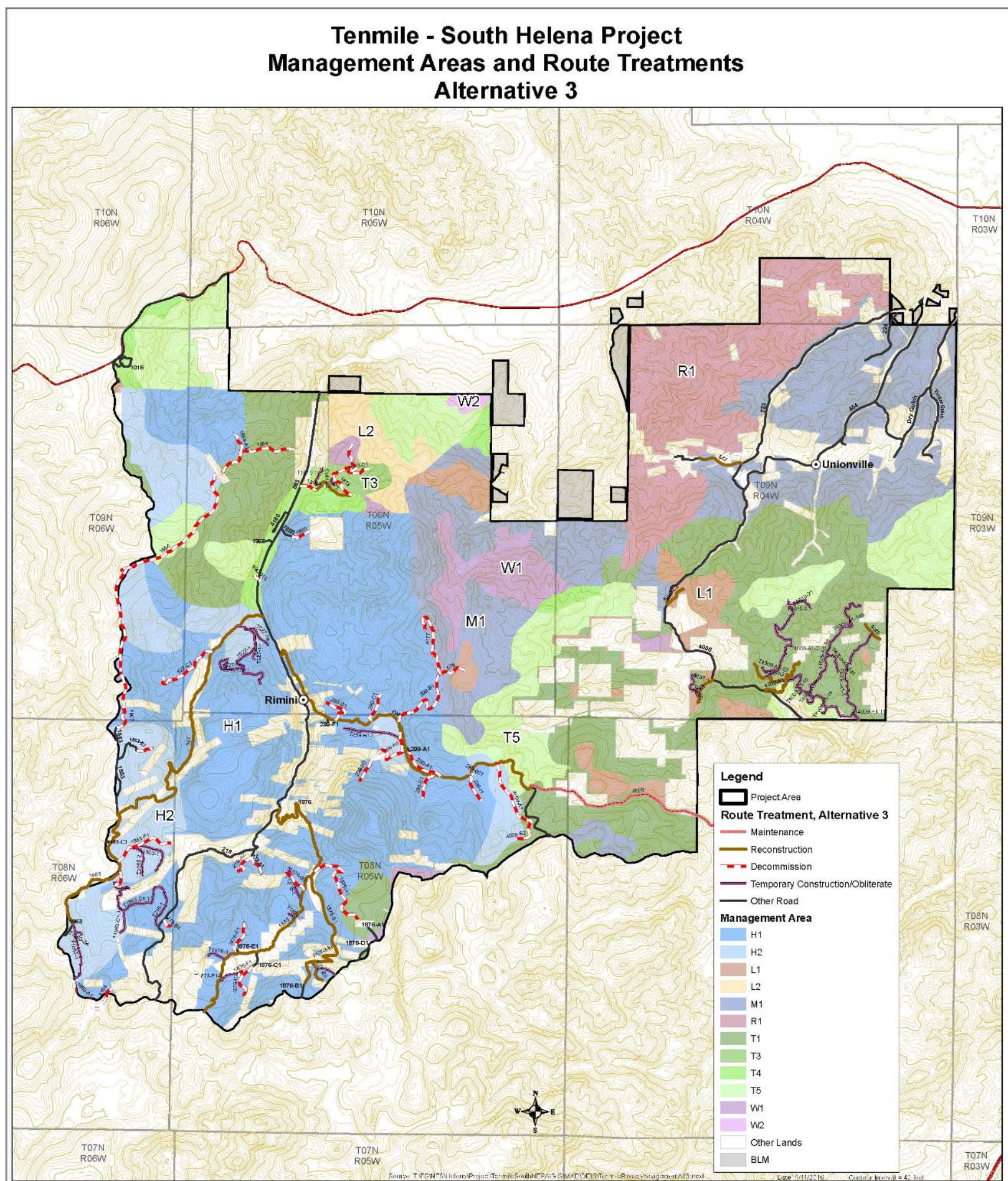
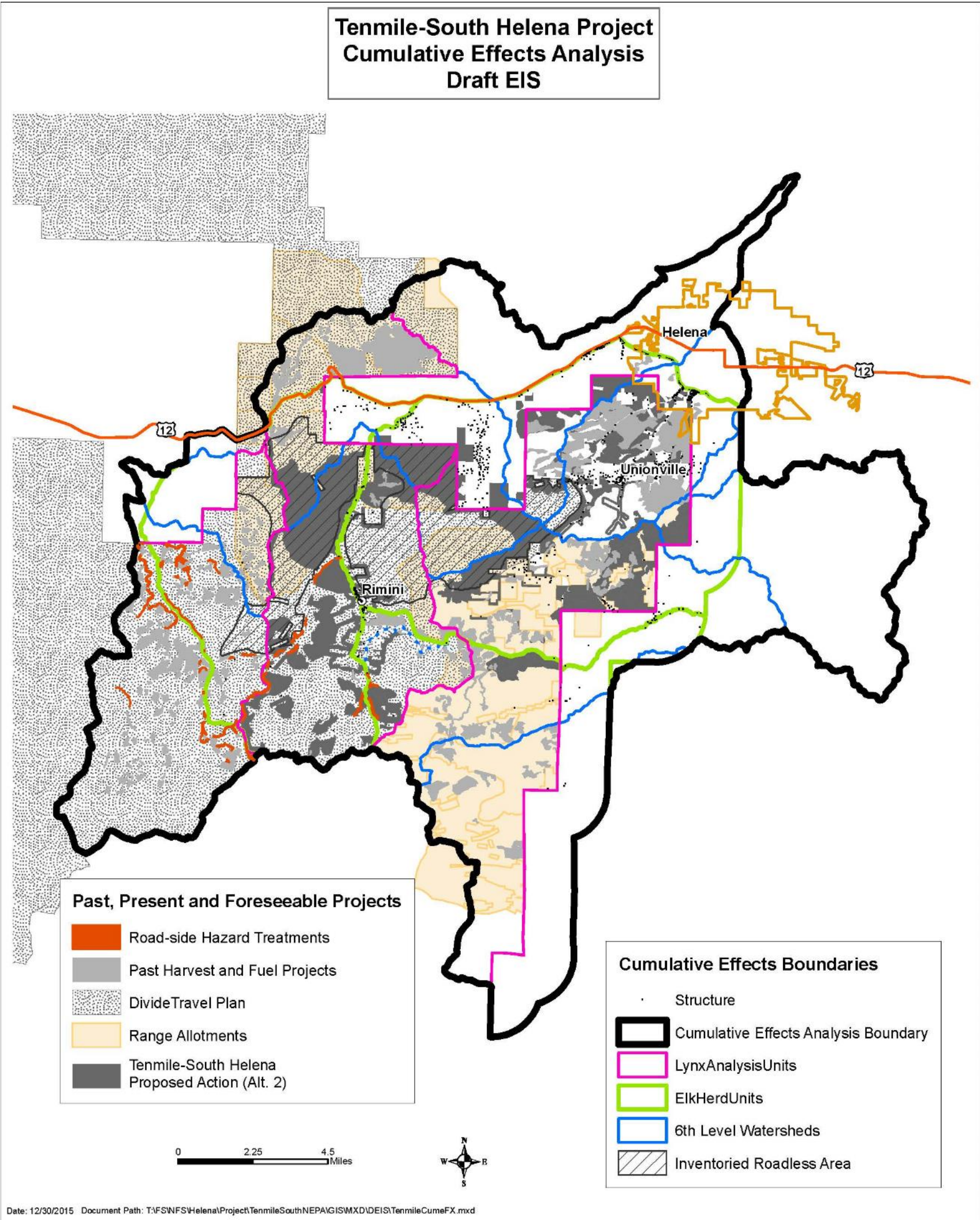


Figure 129. Alternative 3 route treatments.



APPENDIX F: CULTURAL AND HERITAGE RESOURCES



United States
Department of
Agriculture

Forest
Service

Helena National Forest
2880 Skyway Drive
Helena, MT 59601
(406) 449-5201

Lewis & Clark National Forest
1101 15th Street North
Great Falls, MT 59401
(406) 791-7700

File Code: 2360

Date: February 19, 2015

Caroline D. Hall
Assistant Director
Federal Property Management System
Office of Federal Agency Programs
401 F Street NW, Suite 308
Washington, DC 20001-2637

RE: NEPA-NHPA Substitution Process: Tenmile-South Helena Project, Helena National Forest, Montana

Dear Ms. Hall:

The purpose of this letter is to inform you that the Helena National Forest (HNF) is proposing to follow the integrated National Environmental Policy Act (NEPA) – National Historic Preservation Act (NHPA) process in accordance with 36 C.F.R. 800.8 (c) for the Tenmile-South Helena project. Because of the project's scale, NEPA schedule, and multi-year implementation period, the NEPA-NHPA substitution procedures and phased identification process under 36 C.F.R. 800.4 will be more cost-effective than crafting an individual project programmatic agreement or delaying NEPA or the project. The Montana State Historic Preservation Officer (SHPO) concurs with our assessment, per their enclosed letter.

The Tenmile—South Helena Project area encompasses approximately **61,500** acres in Lewis and Clark, Powell, and Jefferson Counties. This includes approximately **49,500** acres of National Forest System Land (NFS), **1,007** acres of public lands administered by the Bureau of Land Management (BLM Lands), and the remaining acres are private lands. No treatments are proposed on private land.

The project area is located within the Upper Tenmile watershed, the primary source of municipal water for the City of Helena. The purpose of the project is to maintain consistent quantity and quality of water within the municipal watershed and improve conditions for public and firefighter safety across the landscape in the event of a wildfire. In order to achieve this purpose, there is a need to create a mosaic of vegetation and fuel structure more resilient to disturbance which would provide for safer, more effective fire suppression actions. Reducing intensity of wildfires and increase fire suppression effectiveness would improve protection measures for the surrounding communities and key municipal watershed infrastructure. These actions would reduce the probability of post-wildfire watershed impacts in the Tenmile municipal watershed. In addition, sources of anthropogenic sediment to streams need to be addressed in order to improve water quality, watershed function, and other resource values in the project area.

Approximately **25,027 acres** are proposed for treatment (**24,020** on NFS Lands and **1,007** on BLM Lands) which would include a combination of commercial harvest of trees, non-commercial vegetation treatments and prescribed fire. Mechanical and/or hand treatment



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methods would be used to accomplish treatment objectives. Analysis of proposed treatment activities on BLM Lands will be evaluated in the analysis for the project. Locations of specific treatment methods would be determined as treatment units are refined through public and collaborative group involvement as well as resource specialist input.

The Forest is using the 800 regulations and *NEPA and NHPA: A Handbook for Integrating NEPA and Section 106* as its guide. In this context, NEPA public scoping for Tenmile-South Helena was initiated in October 2014, with the comment period closing in December 2014. A Draft Environmental Impact Statement (DEIS) will be prepared over the forthcoming months, with the Record of Decision (ROD), and Final EIS anticipated in February of 2016. Implementation would begin spring 2017. A project of this size would be implemented over several years.

In order to inform the NEPA process and initiate NHPA compliance, some field inventory was conducted by the Forest heritage staff in 2014 in accordance with our Site Identification Strategy (SIS). Much of the planning area is rugged mountain terrain. The area has an extensive mining history. In fact, the Environmental Protection Agency (EPA) and the Montana Department of Environmental Quality (DEQ) have identified 150 known abandoned or inactive mine sites within Rimini and Tenmile Creek watershed. The EPA has been conducting remediation activities to mitigate mining impacts to the area's water quality. Miles of primitive mining roads and industrial activities occur across this mountainous landscape. Decades of fire suppression, and now drought and insect infestation and disease, have resulted in higher stand densities, increased crown closures, and dead or dying trees.

Using the baseline data collected from 1979-2014, HNF heritage staff will continue to participate in the development of a NEPA specialist report and DEIS over the forthcoming months of 2015. As is standard practice, we have altered the boundaries of specific treatment units already to either avoid or enhance cultural resources within the project area—for example, removing dense, fire-prone vegetation surrounding historic mining structures and removal of trees in segments of the historic Park Ditch. I would expect that further changes will occur to treatment units as analysis and planning continues preparatory to the EIS.

As forthcoming, the cultural resource section of the draft and final EIS will contain:

1. Description of the integrated NEPA-NHPA process.
2. Existing condition of known cultural resources.
3. Project effect analysis.
4. Project design criteria to protect current or potential historic properties.
5. Implementation schedule to completion of Section 106 compliance.
6. SHPO and tribal consultation protocols.
7. Monitoring plan.
8. Inadvertent discovery and human remains protocol.

The above are standard features of our NEPA documents now. The Tenmile-South Helena Record of Decision will describe how NHPA Section 106 compliance is to be fully completed and how cultural resources will be protected based on the project design criteria described in the

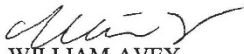
EIS. To meet NHPA requirements, the EIS will be provided for review and comment to your office, tribes and other consulting parties identified during the NEPA process.

Phased identification within the Tenmile-South Helena project area will also continue this coming field season and subsequent field seasons following the NEPA decision until all required compliance SIS survey, evaluation and related cultural work is done. The Forest will provide interim reports of inventory progress and a final report to your office and tribes incorporating all phased work. Where historic properties cannot be protected through avoidance or similar means, an NHPA memorandum of agreement will be developed according to standard NHPA Section 106 procedures.

I look forward to your timely comment on our proposal to use the NEPA-NHPA process rather than developing a project-specific (or forest-wide) programmatic agreement. With other restoration projects in the queue on the HNF, I hope that this substitution process will meet NHPA Section 106 compliance while allowing the NEPA process and critical resource work to move forward.

If you have questions or concerns regarding our proposal, please feel free to contact Deputy Forest Archaeologist Arian Randall at 406-495-3752 / arandall@fs.fed.us or Forest Archaeologist Mark Bodily at 406-791-7742 / mbodily@fs.fed.us. Thank you!

Sincerely,


WILLIAM AVEY
Forest Supervisor

cc: Mark Baumler, MT SHPO
Ira Matt, CSKT THPO
John Murray, Blackfeet THPO
Heather DeGeest, Helena District Ranger
Mark Bodily, Forest Archaeologist
Carl Davis, RO
Mike Kaczor, WO

Enclosures: (7)

UNITED STATES POSTAL SERVICE

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Helena National Forest
2880 Skyway Drive
Helena, MT 59602

RECEIVED
MAR 11 RECD
Helena, MT

Attn: Arian Randall

SENDER: COMPLETE THIS SECTION	COMPLETE THIS SECTION ON DELIVERY
<ul style="list-style-type: none"> Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired. Print your name and address on the reverse so that we can return the card to you. Attach this card to the back of the mailpiece, or on the front if space permits. 	<p>A. Signature  <input type="checkbox"/> Agent <input type="checkbox"/> Addressee</p> <p>B. Received by (Printed Name) </p> <p>C. Date of Delivery 3-5-15</p> <p>D. Is delivery address different from item 1? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If YES, enter delivery address below:</p>
<p>1. Article Addressed to:</p> <p>Cardinal Ed. Hall ACHP 401 F Street NW Suite 308 Washington, DC 20001-2637</p>	<p>3. Service Type</p> <p><input type="checkbox"/> Certified Mail <input type="checkbox"/> Express Mail</p> <p><input type="checkbox"/> Registered <input checked="" type="checkbox"/> Return Receipt for Merchandise</p> <p><input type="checkbox"/> Insured Mail <input type="checkbox"/> C.O.D.</p>
<p>2. Article Number (Transfer from service label)</p> <p>7009 2820 0000 7035 4768</p>	<p>4. Restricted Delivery? (Extra Fee) <input type="checkbox"/> Yes</p>

PS Form 3811, February 2004 Domestic Return Receipt 102595-02-M-1540



United States
Department of
Agriculture

Forest
Service

Helena National Forest
2880 Skyway Drive
Helena, MT 59601
(406) 449-5201

Lewis & Clark National Forest
1101 15th Street North
Great Falls, MT 59401
(406) 791-7700

File Code: 2360

Date: February 2, 2015

Dr. Mark Baumler
Montana SHPO
State Historic Preservation Office
1410 8th Ave
PO Box 201202
Helena, MT 59620-1202

Sent
2/5/15

RE: Tenmile-South Helena EIS

Dear Dr. Baumler:

The purpose of this letter is to inform you that the Helena National Forest is proposing to follow the National Environmental Policy Act (NEPA) substitution procedures provided under 36 C.F.R. 800.8 (c) to comply with Section 106 of the National Historic Preservation Act (NHPA) for the Tenmile-South Helena Project. Because of the project's scope and scale, NEPA schedule, and multi-year implementation period, phased identification under 36 C.F.R. 800.4 will be necessary. We believe that this approach will meet NHPA compliance requirements and be more cost-effective than crafting an individual project programmatic agreement or delaying the NEPA process and project.

The Tenmile—South Helena Project area encompasses approximately **61,500** acres in Lewis and Clark, Powell, and Jefferson Counties. This includes approximately **49,500** acres are National Forest System Land (NFS), **1,007** acres of public lands administered by the Bureau of Land Management (BLM Lands), and remaining acres are private lands. No treatments are proposed on private land.

The project area is located within the Upper Tenmile watershed, the primary source of municipal water for the City of Helena, and extends east through Colorado Gulch and the South Hills area of Helena, Montana. This proposal describes activities on NFS lands in Grizzly Gulch, Orofino Gulch, Corral Gulch, Tenmile Creek, Banner Creek, Beaver Creek; and on BLM lands in Colorado Gulch and south of Helena in Last Chance Gulch.

The purpose of the project is to maintain consistent quantity and quality of water within the municipal watershed and improve conditions for public and firefighter safety across the landscape in the event of a wildfire. In order to achieve this purpose, there is a need to create a mosaic of vegetation and fuel structure more resilient to disturbance which would provide for safer, more effective fire suppression actions. Reducing intensity of wildfires and increase fire suppression effectiveness would improve protection measures for the surrounding communities and key municipal watershed infrastructure. These actions would reduce the probability of post-wildfire watershed impacts in the Tenmile municipal watershed. In addition, sources of anthropogenic sediment to streams need to be addressed in order improve water quality,



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watershed function, and other resource values in the project area.

Approximately **25,027 acres** are proposed for treatment (**24,020** on NFS Lands and **1,007** on BLM Lands) which would include a combination of commercial harvest of trees, non-commercial vegetation treatments and prescribed fire. Mechanical and/or hand treatment methods would be used to accomplish treatment objectives. Analysis of proposed treatment activities on BLM Lands will be evaluated in the analysis for the project. Locations of specific treatment methods would be determined as treatment units are refined through public and collaborative group involvement as well as resource specialist input.

NEPA public scoping for Tenmile-South Helena was initiated in October 2014, with the comment period closing December 2014. An Environmental Impact Statement (EIS) will be prepared, with the Draft EIS scheduled for April 2015. The decision record and Finding of No Significant Impact (FONSI) are anticipated in February 2016. Implementation would likely begin in the spring of 2017. A project of this size will be implemented over several years.

In order to inform the NEPA process and initiate NHPA compliance, background research and field inventory will be conducted by the Forest heritage staff in 2015 in accordance with our Site Identification Strategy (SIS). Much of the planning area is rugged mountain terrain. The area has an extensive mining history. In fact, the Environmental Protection Agency (EPA) and the Montana Department of Environmental Quality (DEQ) have identified 150 known abandoned or inactive mine sites within Rimini and Tenmile Creek watersheds. The EPA has been conducting remediation activities to mitigate mining impacts to the area's water quality. Miles of primitive mining roads and industrial activities occur across this mountainous landscape. The Confederated Salish and Kootenai Tribes and the Blackfoot Tribe will be engaged in this project consultations and field reviews, per our tribal consultation protocols.

Using this baseline data, Helena NF heritage staff will continue to participate in the development of a NEPA specialist report and EIS over the next months of 2015. The cultural resource section of the EIS will contain:

1. Notification that the NEPA-NHPA integrated process is being used.
2. Existing condition of known cultural resources.
3. Project effect analysis.
4. Project design criteria to protect current or potential historic properties.
5. Implementation schedule to completion of Section 106 compliance.
6. SHPO and tribal consultation protocols.
7. Monitoring plan.

These are largely standard features of our NEPA documents now. The resulting Tenmile-South Helena FONSI will describe how NHPA Section 106 compliance will be completed and how cultural resources will be protected based on the design criteria in the EIS. The EIS will be provided to your office, tribes and other identified consulting parties for review and comment, including the ACHP should they decide to participate in this process.

Phased identification within the Tenmile-South Helena project area will continue this coming field season and subsequent field seasons following the NEPA decision until all required compliance survey is done per the SIS. The Forest will provide interim reports of inventory progress and a final report to your office and tribes incorporating all phased work. Where historic properties cannot be protected through avoidance or similar means, an NHPA memorandum of agreement will be developed according to standard NHPA Section 106 procedures.

Pending your response to this letter, I will similarly notify the ACHP of our intent to use the NEPA-NHPA substitution process for Tenmile-South Helena in lieu of a project programmatic agreement. The Forest is following the process outlined in 36 C.F.R. 800.8 and *NEPA and NHPA: A Handbook for Integrating NEPA and Section 106*, but this is new territory for us. We therefore look to your advice and direction. Other large restoration projects are coming on-line, so I hope that the NEPA-NHPA substitution process will prove an acceptable compliance agreement alternative.

I look forward to your timely response. If you have further concerns or questions, please contact Deputy Forest Archaeologist Arian Randall at 406-495-3750 / arandall@fs.fed.us or Forest Archaeologist Mark Bodily at 406-791-7742 / mbodily@fs.fed.us. Thank you!

Sincerely,



WILLIAM AVEY
Forest Supervisor

Cc:
Carl Davis, RO
Mark Bodily
Heather DeGeest



United States
Department of
Agriculture

Forest
Service

Helena National Forest
2880 Skyway Drive
Helena, MT 59601
(406) 449-5201

Lewis & Clark National Forest
1101 15th Street North
Great Falls, MT 59401
(406) 791-7700

File Code: 1560

Date: March 6, 2015

Mr. Nathan Small
Tribal Council Chairman
Shoshone-Bannock
Tribes
P.O. Box 306
Fort Hall, ID 83203

sent 3/10

RE: Tenmile-South Helena EIS

Dear Mr. Small:

The purpose of this letter is to inform you that the Helena National Forest is proposing to follow the National Environmental Policy Act (NEPA) substitution procedures provided under 36 C.F.R. 800.8 (c) to comply with Section 106 of the National Historic Preservation Act (NHPA) for the Tenmile-South Helena Project. Because of the project's scope and scale, NEPA schedule, and multi-year implementation period, phased identification under 36 C.F.R. 800.4 will be necessary. We believe that this approach will meet NHPA compliance requirements and be more cost-effective than crafting an individual project programmatic agreement or delaying the NEPA process and project.

The Tenmile—South Helena Project area encompasses approximately **61,500** acres in Lewis and Clark, Powell, and Jefferson Counties. This includes approximately **49,500** acres are National Forest System Land (NFS), **1,007** acres of public lands administered by the Bureau of Land Management (BLM Lands), and remaining acres are private lands. No treatments are proposed on private land.

The project area is located within the Upper Tenmile watershed, the primary source of municipal water for the City of Helena, and extends east through Colorado Gulch and the South Hills area of Helena, Montana. This proposal describes activities on NFS lands in Grizzly Gulch, Orofino Gulch, Corral Gulch, Tenmile Creek, Banner Creek, Beaver Creek; and on BLM lands in Colorado Gulch and south of Helena in Last Chance Gulch.

The purpose of the project is to maintain consistent quantity and quality of water within the municipal watershed and improve conditions for public and firefighter safety across the landscape in the event of a wildfire. In order to achieve this purpose, there is a need to create a mosaic of vegetation and fuel structure more resilient to disturbance which would provide for safer, more effective fire suppression actions. Reducing intensity of wildfires and increase fire suppression effectiveness would improve protection measures for the surrounding communities and key municipal watershed infrastructure. These actions would reduce the probability of post-wildfire watershed impacts in the Tenmile municipal watershed. In addition, sources of anthropogenic sediment to streams need to be addressed in order improve water quality,



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watershed function, and other resource values in the project area.

Approximately **25,027 acres** are proposed for treatment (**24,020** on NFS Lands and **1,007** on BLM Lands) which would include a combination of commercial harvest of trees, non-commercial vegetation treatments and prescribed fire. Mechanical and/or hand treatment methods would be used to accomplish treatment objectives. Analysis of proposed treatment activities on BLM Lands will be evaluated in the analysis for the project. Locations of specific treatment methods would be determined as treatment units are refined through public and collaborative group involvement as well as resource specialist input.

NEPA public scoping for Tenmile-South Helena was initiated in October 2014, with the comment period closing December 2014. An Environmental Impact Statement (EIS) will be prepared, with the Draft EIS scheduled for April 2015. The decision record and Record of Decision (ROD) are anticipated in February 2016. Implementation would likely begin in the spring of 2017. A project of this size will be implemented over several years.

In order to inform the NEPA process and initiate NHPA compliance, background research and field inventory will be conducted by the Forest heritage staff in 2015 in accordance with our Site Identification Strategy (SIS). Much of the planning area is rugged mountain terrain. The area has an extensive mining history. In fact, the Environmental Protection Agency (EPA) and the Montana Department of Environmental Quality (DEQ) have identified 150 known abandoned or inactive mine sites within Rimini and Tenmile Creek watersheds. The EPA has been conducting remediation activities to mitigate mining impacts to the area's water quality. Miles of primitive mining roads and industrial activities occur across this mountainous landscape.

Using this baseline data, Helena NF heritage staff will continue to participate in the development of a NEPA specialist report and EIS over the next months of 2015. The cultural resource section of the EIS will contain:

1. Notification that the NEPA-NHPA integrated process is being used.
2. Existing condition of known cultural resources.
3. Project effect analysis.
4. Project design criteria to protect current or potential historic properties.
5. Implementation schedule to completion of Section 106 compliance.
6. SHPO and tribal consultation protocols.
7. Monitoring plan.

These are largely standard features of our NEPA documents now. The resulting Tenmile-South Helena ROD will describe how NHPA Section 106 compliance will be completed and how cultural resources will be protected based on the design criteria in the EIS. The EIS will be provided to your office, tribes and other identified consulting parties for review and comment, including the ACHP should they decide to participate in this process.


Phased identification within the Tenmile-South Helena project area will continue this coming field season and subsequent field seasons following the NEPA decision until all required

compliance survey is done per the SIS. The Forest will provide interim reports of inventory progress and a final report to your office and SHPO incorporating all phased work. Where historic properties cannot be protected through avoidance or similar means, an NHPA memorandum of agreement will be developed according to standard NHPA Section 106 procedures.

In addition to notifying your office of our intent to use this substitution approach, **we would greatly appreciate input on any potential TCP's within the project area.** This information will be held confidential in the Heritage project files and not release to the public. Potential TCP information will help guide treatments and mitigation protection measures.

I look forward to your timely response. If you have further concerns or questions, please contact Deputy Forest Archaeologist Arian Randall at 406-495-3750 / arandall@fs.fed.us or Forest Archaeologist Mark Bodily at 406-791-7742 / mbodily@fs.fed.us. Thank you!

Sincerely,


WILLIAM AVEY
Forest Supervisor

Enclosures

Cc:
Carl Davis, RO
Mark Bodily
Carol Hatfield



United States
Department of
Agriculture

Forest
Service

Helena National Forest
2880 Skyway Drive
Helena, MT 59601
(406) 449-5201

Lewis & Clark National Forest
1101 15th Street North
Great Falls, MT 59401
(406) 791-7700

File Code: 1560

Date: March 6, 2015

Mr. Joe Durglo
Tribal Council Chairman
Confederated Salish & Kootenai Tribes
42487 Complex Blvd.
PO Box 278
Pablo, MT 59855

RE: Tenmile-South Helena EIS

Dear Mr. Durglo:

The purpose of this letter is to inform you that the Helena National Forest is proposing to follow the National Environmental Policy Act (NEPA) substitution procedures provided under 36 C.F.R. 800.8 (c) to comply with Section 106 of the National Historic Preservation Act (NHPA) for the Tenmile-South Helena Project. Because of the project's scope and scale, NEPA schedule, and multi-year implementation period, phased identification under 36 C.F.R. 800.4 will be necessary. We believe that this approach will meet NHPA compliance requirements and be more cost-effective than crafting an individual project programmatic agreement or delaying the NEPA process and project.

The Tenmile—South Helena Project area encompasses approximately **61,500** acres in Lewis and Clark, Powell, and Jefferson Counties. This includes approximately **49,500** acres are National Forest System Land (NFS), **1,007** acres of public lands administered by the Bureau of Land Management (BLM Lands), and remaining acres are private lands. No treatments are proposed on private land.

The project area is located within the Upper Tenmile watershed, the primary source of municipal water for the City of Helena, and extends east through Colorado Gulch and the South Hills area of Helena, Montana. This proposal describes activities on NFS lands in Grizzly Gulch, Orofino Gulch, Corral Gulch, Tenmile Creek, Banner Creek, Beaver Creek; and on BLM lands in Colorado Gulch and south of Helena in Last Chance Gulch.

The purpose of the project is to maintain consistent quantity and quality of water within the municipal watershed and improve conditions for public and firefighter safety across the landscape in the event of a wildfire. In order to achieve this purpose, there is a need to create a mosaic of vegetation and fuel structure more resilient to disturbance which would provide for safer, more effective fire suppression actions. Reducing intensity of wildfires and increase fire suppression effectiveness would improve protection measures for the surrounding communities and key municipal watershed infrastructure. These actions would reduce the probability of post-wildfire watershed impacts in the Tenmile municipal watershed. In addition, sources of anthropogenic sediment to streams need to be addressed in order improve water quality,



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compliance survey is done per the SIS. The Forest will provide interim reports of inventory progress and a final report to your office and SHPO incorporating all phased work. Where historic properties cannot be protected through avoidance or similar means, an NHPA memorandum of agreement will be developed according to standard NHPA Section 106 procedures.

In addition to notifying your office of our intent to use this substitution approach, **we would greatly appreciate input on any potential TCP's within the project area.** This information will be held confidential in the Heritage project files and not release to the public. Potential TCP information will help guide treatments and mitigation protection measures.

I look forward to your timely response. If you have further concerns or questions, please contact Deputy Forest Archaeologist Arian Randall at 406-495-3750 / arandall@fs.fed.us or Forest Archaeologist Mark Bodily at 406-791-7742 / mbodily@fs.fed.us. Thank you!

Sincerely,



WILLIAM AVEY
Forest Supervisor

Enclosures

Cc:
Carl Davis, RO
Mark Bodily
Heather DeGeest



United States
Department of
Agriculture

Forest
Service

Helena National Forest
2880 Skyway Drive
Helena, MT 59601
(406) 449-5201

Lewis & Clark National Forest
1101 15th Street North
Great Falls, MT 59401
(406) 791-7700

File Code: 1560

Date: March 6, 2015

Mr. Harry Barnes
Tribal Council Chairman
Blackfeet Nation
1 Agency Square
P.O. Box 850
Browning, MT 59417

RE: Tenmile-South Helena EIS

Dear Mr. Barnes:

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watershed function, and other resource values in the project area.

Approximately **25,027 acres** are proposed for treatment (**24,020** on NFS Lands and **1,007** on BLM Lands) which would include a combination of commercial harvest of trees, non-commercial vegetation treatments and prescribed fire. Mechanical and/or hand treatment methods would be used to accomplish treatment objectives. Analysis of proposed treatment activities on BLM Lands will be evaluated in the analysis for the project. Locations of specific treatment methods would be determined as treatment units are refined through public and collaborative group involvement as well as resource specialist input.

NEPA public scoping for Tenmile-South Helena was initiated in October 2014, with the comment period closing December 2014. An Environmental Impact Statement (EIS) will be prepared, with the Draft EIS scheduled for April 2015. The decision record and Record of Decision (ROD) are anticipated in February 2016. Implementation would likely begin in the spring of 2017. A project of this size will be implemented over several years.

In order to inform the NEPA process and initiate NHPA compliance, background research and field inventory will be conducted by the Forest heritage staff in 2015 in accordance with our Site Identification Strategy (SIS). Much of the planning area is rugged mountain terrain. The area has an extensive mining history. In fact, the Environmental Protection Agency (EPA) and the Montana Department of Environmental Quality (DEQ) have identified 150 known abandoned or inactive mine sites within Rimini and Tenmile Creek watersheds. The EPA has been conducting remediation activities to mitigate mining impacts to the area's water quality. Miles of primitive mining roads and industrial activities occur across this mountainous landscape.

Using this baseline data, Helena NF heritage staff will continue to participate in the development of a NEPA specialist report and EIS over the next months of 2015. The cultural resource section of the EIS will contain:

1. Notification that the NEPA-NHPA integrated process is being used.
2. Existing condition of known cultural resources.
3. Project effect analysis.
4. Project design criteria to protect current or potential historic properties.
5. Implementation schedule to completion of Section 106 compliance.
6. SHPO and tribal consultation protocols.
7. Monitoring plan.

These are largely standard features of our NEPA documents now. The resulting Tenmile-South Helena ROD will describe how NHPA Section 106 compliance will be completed and how cultural resources will be protected based on the design criteria in the EIS. The EIS will be provided to your office, tribes and other identified consulting parties for review and comment, including the ACHP should they decide to participate in this process.

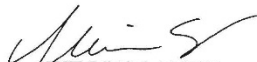
Phased identification within the Tenmile-South Helena project area will continue this coming field season and subsequent field seasons following the NEPA decision until all required

compliance survey is done per the SIS. The Forest will provide interim reports of inventory progress and a final report to your office and SHPO incorporating all phased work. Where historic properties cannot be protected through avoidance or similar means, an NHPA memorandum of agreement will be developed according to standard NHPA Section 106 procedures.

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Sincerely,


WILLIAM AVEY
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Mike Munoz